Facility Plan

Wastewater Treatment Facility

Foley, Minnesota

FOLEY 142860 | January 9, 2019

Building a Better World for All of Us©

Engineers | Architects | Planners | Scientists

Building a Better World
for All of Us®

January 9, 2019

RE: Wastewater Treatment Facility
Facility Plan
Foley, Minnesota
SEH No. FOLEY 142860 4.00

Ms. Sarah Brunn
City Administrator
City of Foley
251 Fourth Avenue North
PO Box 709
Foley, MN 56329-0709

Dear Ms. Brunn:

We are pleased to submit to you a Wastewater Treatment Facilities Plan for the City of Foley. The Facility Plan is used to evaluate the existing facility and the needs of the City for a planning period of 20 years. The current system has aging infrastructure and is near its hydraulic capacity. In order to meet the growth planned for the City of Foley more capacity for the wastewater treatment system is needed. The Facility Plan includes the evaluation and cost estimates for alternatives for wastewater treatment to provide the capacity needed and meet regulatory requirements.

We would like to thank you for the opportunity to work in cooperation with your city staff to provide this evaluation and recommendation for future improvements at the wastewater treatment facilities.

Sincerely,

Jessica Hedin, PE
Project Manager

ejm/mrb
p:\fj\f\foley\142860\4-prelim-dsgn-rpts\43-prelim-dsgn\facility plan\facility plan - draft 010919.docx

Facility Plan

Wastewater Treatment Facility
Foley, Minnesota

SEH No. FOLEY 142860

January 9, 2019

I hereby certify that this report was prepared by me or under my direct supervision, and that I am a duly Licensed Professional Engineer under the laws of the State of Minnesota.

____
Jessica Hedin, PE

Date: January 9, 2019   License No.: 41639

Short Elliott Hendrickson Inc.
1200 25th Avenue South
P.O. Box 1717
St. Cloud, MN 56302-1717
320.229.4300

SEH

Distribution

No. of Copies	Sent to
___	Sarah Brunn City Administrator 251 4th Avenue North Foley, Minnesota 56329
___	Mark Pappenfus Public Works Director 321 4th Avenue North Foley, Minnesota 56329
___	Bob Jones President/CEO, PouchTec 347 Glen Street Foley, Minnesota 56329
___	Shawn Zappa Plant Manager, PouchTec 347 Glen Street Foley, Minnesota 56329

Executive Summary

Contents

Contents (continued)

List of Tables

Contents (continued)

List of Figures

List of Appendices

Facility Plan

Wastewater Treatment Facility

Prepared for City of Foley, Minnesota

1 Introduction

This Facility Plan has been prepared for the City of Foley (City) to aid the community in providing adequate wastewater treatment that meets current and future needs. This plan evaluates the ability of the existing wastewater treatment facilities to meet effluent regulations and address the deterioration of aging equipment and structures. Several alternatives to improve the existing facilities are presented, along with their cost implications.

This plan contains information required by the Minnesota Pollution Control Agency (MPCA) as part of their consideration for a wastewater treatment project for grant or loan participation. This report will be submitted to the MPCA for review and approval. The public will be given the opportunity to comment on the facility plan at a formal public hearing held before the MPCA will issue approval. The plan should then become the framework upon which future improvements to the wastewater facility are based.

1.1 Planning Area

The planning area for the Facility Plan includes the approximately 1,600 acres (2.51 mi^2) that comprise the City of Foley as shown in Figure 1. Figure 1 also illustrates the location of the two pond systems that comprise the Foley wastewater treatment facility (WWTF), Birch Pond, and Golf Pond. Foley's NPDES/SDS discharge permit associates outfall SD001 with Birch Pond and SD002 with Golf Pond.

An enlarged site map for Birch and Golf Ponds can be seen in Figures 2 and 3 respectively.

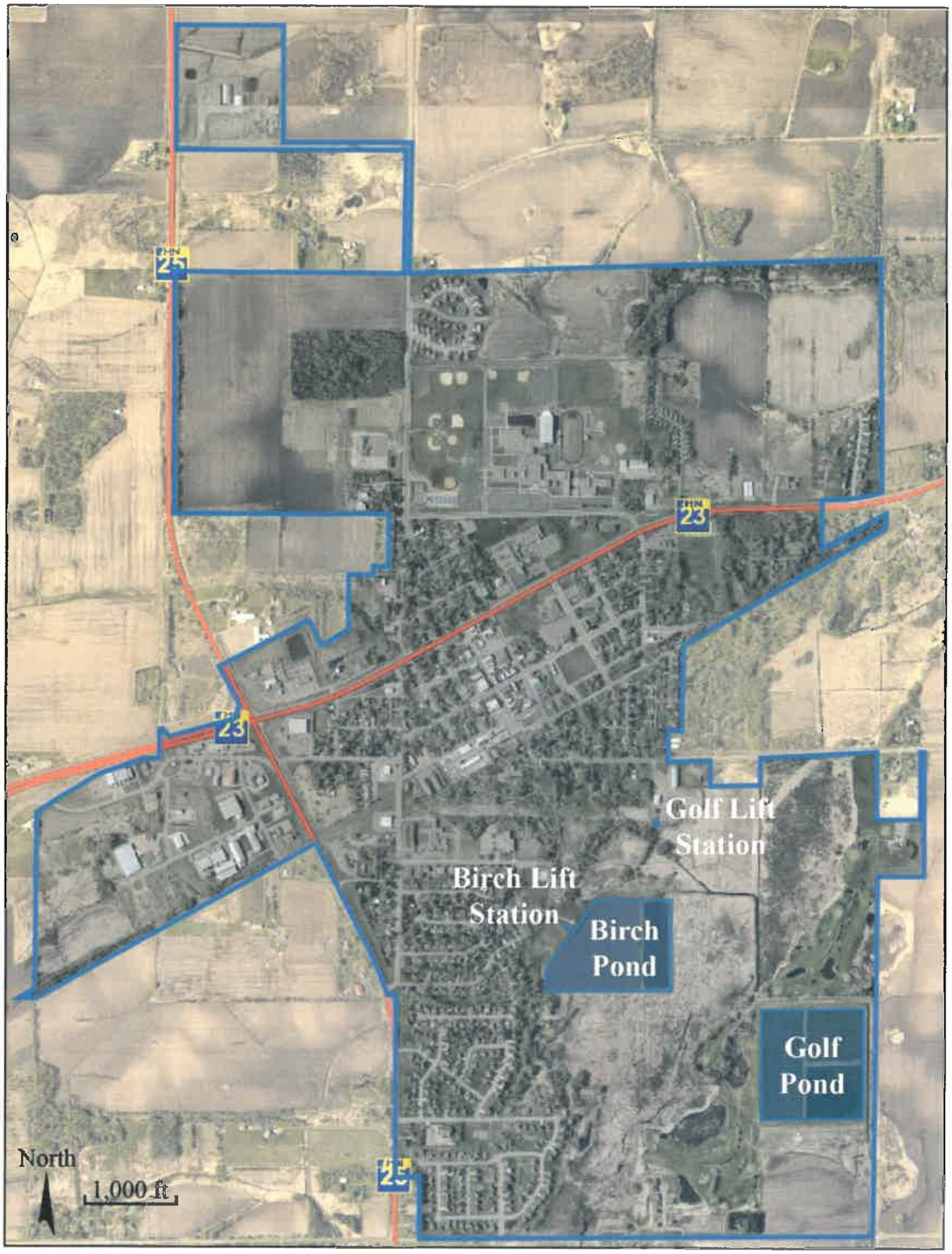
1.2 Historical, Archaeological, Cultural, and Environmental Elements

An Environmental Information Worksheet (EIW) is required by the MPCA as part of a facility plan. The completed EIW can be found in Appendix A. As part of this planning step, the State requires information related to the presence of rare, endangered, or historic resources and/or landmarks.

The National Register for Historic Places was searched for the planning area. The results of the search can be found in Appendix A. There are no historical, archaeological, or cultural areas within the project boundaries. Adjacent properties are not anticipated to be adversely affected.

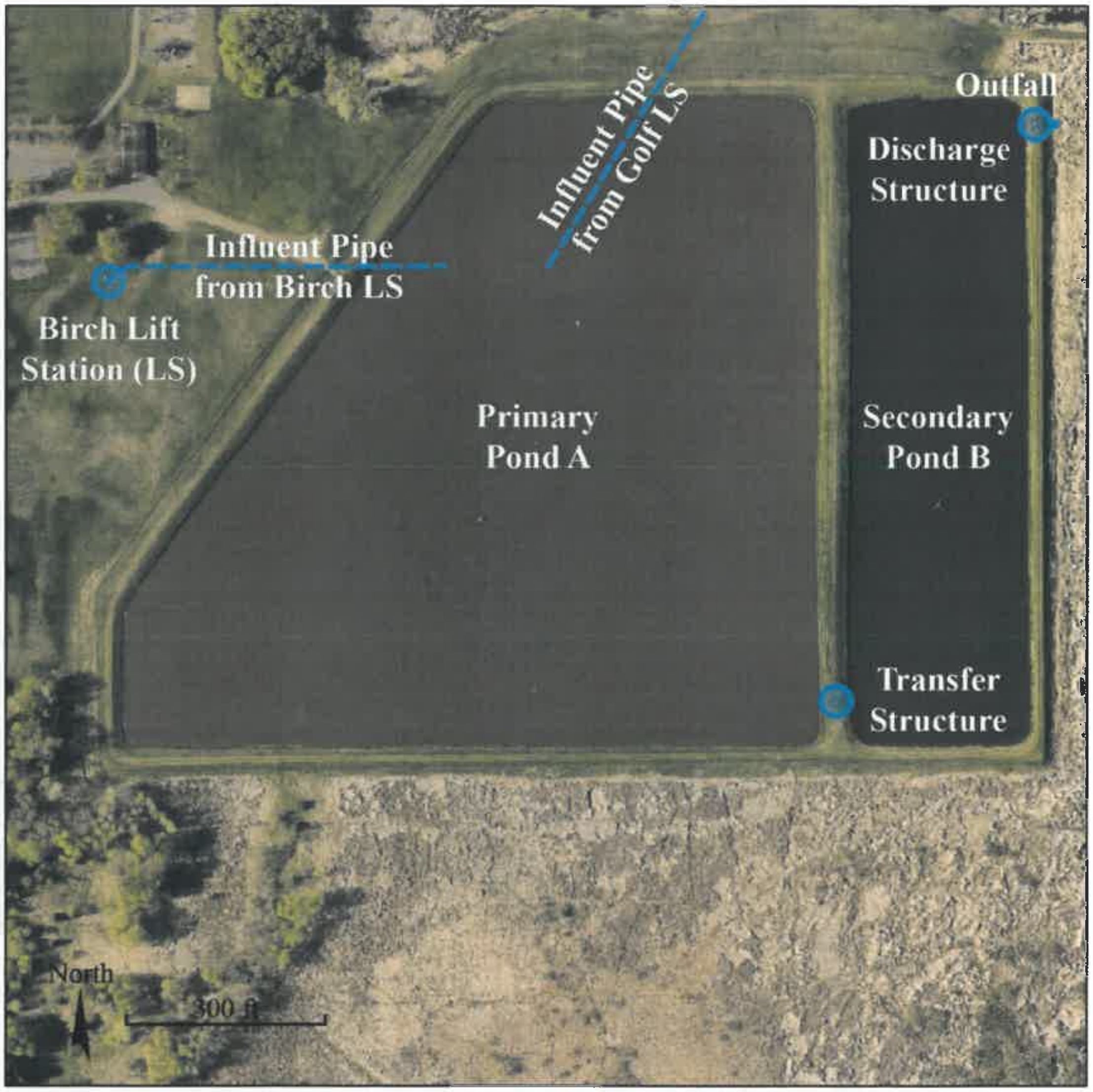
The Minnesota Department of Natural Resources was also contacted to determine if rare plant or animal species or other significant natural features exist near the project area. The National Heritage and Nongame Research Program database was also searched and the results can be found in Appendix A. Any potential project at wastewater treatment facilities should have no impact on any natural features.

Figure 1 – **Aerial of Foley, MN and Location of Birch Pond (SD001) and Golf Pond (SD002)**



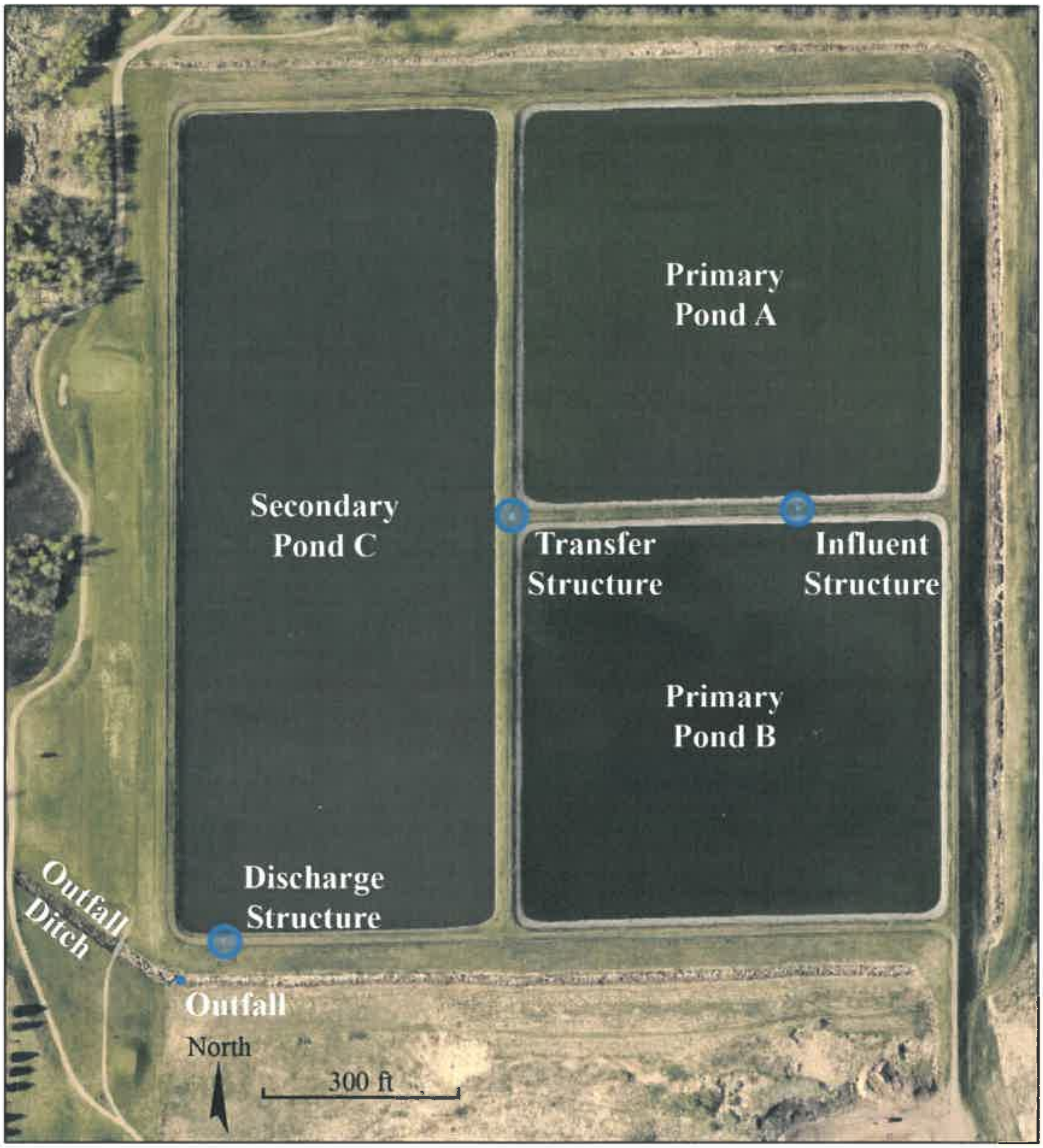
Aerial courtesy of Beacon and Schneider Corporation

Figure 2 – **Aerial of Birch Pond (SD001) with Structures Outfall**



Aerial courtesy of Beacon and Schneider Corporation

Figure 3 – **Aerial of Golf Pond (SD002) with Structures Outfall**



Aerial courtesy of Beacon and Schneider Corporation

2 Regulatory Requirements

The Minnesota Pollution Control Agency (MPCA) has responsibility for determining the best use of the State's waters and quality of effluent necessary to meet these uses. In accordance with this responsibility, they have defined seven water use "classes" and grouped all the State's wasters into one or more of these classes. Each contains a list of substances or characteristics that must be met before that water is suitable for its designated use. This list of substances and their permissible concentrations are referred to as "water quality standards." These standards have been established after appropriate public hearings, have been approved by the United States Environmental Protection Agency (USEPA), and carry the weight of State and Federal law.

Treated wastewater from the City of Foley's Wastewater Treatment Facility (WWTF) is discharged into the Stoney Brook. The Stoney Brook is classified as a Class 3C, 4A, 4B, 5, 6, and 7 waterway. The definitions of these classifications are as follows:

- Class 3C: The quality of Class 3C waters of the state shall be such as to permit their use for industrial cooling and materials transport without a high degree of treatment being necessary to avoid severe fouling, corrosion, scaling, or their unsatisfactory conditions.
- Class 4A: The quality of Class 4A waters of the state shall be such as to permit their use for irrigation without significant damage or adverse effects upon any crops or vegetation usually grown in the waters or area, including truck garden crops.
- Class 4B: The quality of Class 4B waters of the state shall be such as to permit their use by livestock and wildlife without inhibition or injurious effects.
- Class 5: The quality of Class 5 waters of the state shall be such as to be suitable for aesthetic enjoyment of scenery, to avoid any interference with navigation or damaging effects on property.
- Class 6: The quality of Class 6 waters may be under other jurisdictions and in other areas to which the waters of the state are tributary, and may include any or all of the uses listed in Minnesota Rules parts 7050.0221 to 7050.0225, plus any other possible beneficial uses.
- Class 7: The quality of Class 7 waters of the state shall be such as to protect aesthetic qualities, secondary body contact use, and groundwater for use as a potable water supply.

2.1 Effluent Standards

The Foley WWTF discharges wastewater in accordance with Minnesota National Pollutant Discharge Elimination System (NPDES)/State Disposal System (SDS) permit number MN0023098. A copy of the current permit is included in Appendix B. This permit became effective March 1, 2012 and expired February 28, 2017. The facility has not been issued a draft permit at the time of this report and continues to operate under the March 1, 2012 permit. Effluent concentration and mass limit standards set by the State for Birch Pond are summarized in Table 1. Effluent concentration and mass limit standards set by the State for Golf Pond are summarized in Table 2. Effluent concentration and mass limit standards set by the State for the calculated combined flow of Birch and Golf Ponds are summarized in Table 3.

Table 1 – **Current NPDES/SDS Permit Limits for Birch Pond (SD001)**

Parameter	Final Limit	Final Limit	Limit Type
5-day Carbonaceous Biochemical Oxygen Demand ($cBOD_5$)	25 mg/L 40 mg/L	77 kg/day 123 kg/day	Calendar Month Average Maximum Calendar Week Average
Total Suspended Solids (TSS)	45 mg/L 65 mg/L	138 kg/day 200 kg/day	Calendar Month Average Maximum Calendar Week Average
pH	9.0 su 6.0 su		Calendar Month Maximum Calendar Month Minimum
Fecal Coliform	200 MPN/100ml (May-Oct)		Calendar Month Geometric Mean
Dissolved Oxygen	Monitor		Calendar Month Minimum
Phosphorus, Total (as P)	Monitor Monitor Monitor		Calendar Month Average Calendar Month Total Calendar Year to Date Total
Nitrite plus Nitrate, Total (as N)	Monitor		Calendar Month Maximum
Nitrogen, Ammonia, Total (as N)	Monitor		Calendar Month Maximum
Nitrogen, Kjeldahl, Total	Monitor		Calendar Month Maximum
Total Dissolved Solids (TDS)	Monitor		Calendar Month Maximum
Sulfate, Total (as SO_4)	Monitor		Calendar Month Maximum

Table 2 – **Current NPDES/SDS Permit Limits for Golf Pond (SD002)**

Parameter	Final Limit	Final Limit	Limit Type
5-day Carbonaceous Biochemical Oxygen Demand ($cBOD_5$)	25 mg/L 40 mg/L	193 kg/day 308 kg/day	Calendar Month Average Maximum Calendar Week Average
Total Suspended Solids (TSS)	45 mg/L 65 mg/L	347 kg/day 501 kg/day	Calendar Month Average Maximum Calendar Week Average
pH	9.0 su 6.0 su		Calendar Month Maximum Calendar Month Minimum
Fecal Coliform	200 MPN/100ml (May-Oct)		Calendar Month Geometric Mean
Dissolved Oxygen	Monitor		Calendar Month Minimum
Phosphorus, Total (as P)	Monitor Monitor Monitor		Calendar Month Average Calendar Month Total Calendar Year to Date Total
Nitrite plus Nitrate, Total (as N)	Monitor		Calendar Month Maximum
Nitrogen, Ammonia, Total (as N)	Monitor		Calendar Month Maximum
Nitrogen, Kjeldahl, Total	Monitor		Calendar Month Maximum
Total Dissolved Solids (TDS)	Monitor		Calendar Month Maximum
Sulfate, Total (as SO_4)	Monitor		Calendar Month Maximum

Table 3 – **Mass Loading Limits for Combined System (SD001 & SD002)**

Parameter	Final Limit	Limit Type
Phosphorus, Total (as P)	1,026 kg/yr	Calendar Year to Date Total

2.2 Probable Future Limits

The City of Foley is currently operating their WWTF with an expired NPDES/SDS permit. An effluent standards review was conducted in response to a request for preliminary effluent limits for the Foley WWTF. The effluent review included several discharge scenarios based on the future growth of the community and treatment method utilized at the WWTF. A copy of the preliminary effluent limits received from MPCA is included in Appendix C.

2.2.1 Antidegradation

Federal antidegradation regulations require states to adopt antidegradation policies and identify implementation procedures that maintain and protect existing uses, prevent unnecessary degradation of existing high water quality, and maintain and protect the quality of waters identified for their outstanding value. The MPCA adopted new antidegradation rules that became effective November 21, 2016 and permit applications received after this date will need to comply with the new rules. This means if a community wants to increase the flow or load to the receiving stream, they must remain at or below the current permitted mass loading to that receiving stream.

With that being said, according to the antidegradation rules, high water quality (i.e. quality above that which is required to support aquatic life and recreation) may be lowered, but only under the following specific conditions:

- The degradation is necessary.
- The degradation is important to accommodate important economic and social development.
- There is an opportunity for public participation and intergovernmental cooperation.
- All application state and federal water pollution control statutes and rules are achieved.

These conditions would have to be shown in an ***antidegradation review*** that would be prepared by the City and its engineers and be reviewed and approved by MPCA. An antidegradation review provides an avenue for cities to increase flow or loading without freezing mass loads. It should be noted that a full antidegradation review must be completed and approved in order to determine the final limits for the selected option evaluated in a facility plan.

The City of Foley has elected to accept the frozen mass limits set forth in the preliminary effluent limits received from MPCA in lieu of preparing an antidegradation review. The preliminary effluent limits provide effluent limitations for both controlled and continuous discharge scenarios. Please note the preliminary effluent limits were based on average wet weather flows of 607,000 gallons per day (gpd) for a controlled discharge alternative and 691,000 gpd for a continuous discharge alternative. The projected flows for the City of Foley were revisited after receiving the preliminary effluent limits to 570,300 gpd, for both controlled and continuous discharge alternatives. The MPCA was notified of the flow change, and in an email dated September 21, 2018, the MPCA said that the revised flow would not change the preliminary effluent limits as long as the frozen mass limits for cBOD and TSS are accepted by the City. Therefore, the relevant effluent limits for the purpose of this report are summarized in Table 4.

Table 4 – **Summary of Preliminary Effluent Limits**

Parameter	Stabilization Pond Alternative	Aerated Pond Alternative	Mechanical WWTF Alternative
Discharge Type	Controlled	Continuous	Continuous
Average wet weather flow (AWW), gpd	570,300	570,300	570,300
$cBOD_5$ Frozen Mass Limit, kg/d	269.72	35.15	35.15
$cBOD_5$ Calculated Concentration Equivalent, mg/L	14.99	16.29	16.29
TSS Frozen Mass Limit, kg/d	486.0	63.26	63.26
TSS Calculated Concentration Equivalent, mg/L	27.0	29.32	29.32
TP Frozen Mass Limit, kg/yr	1,026	1,026	1,026
TP Calculated Concentration Equivalent, mg/L	1.3	1.3	1.3
Fecal Coliform, orgs/100 mL	200	200	200
pH, su	6.0-9.0	6.0-9.0	6.0-9.0

$cBOD_5$ = 5-day carbonaceous biological oxygen demand
kg/d = kilograms per day
mg/L = milligrams per liter
TSS = total suspended solids
mL = milliliter

3 Flows and Loading

The City's historical influent and effluent data from discharge monitoring reports (DMRs) for the Foley WWTF from July 2014 thru July 2017 were reviewed. These data sets were used to gain an understanding of the existing flows and loading conditions.

The community is home to one significant industrial user (SIU), PouchTec Industries, LLC (PouchTec). PouchTec has also provided historical flow and load data from its low strength industrial effluent. Historical influent and effluent data was reviewed from December 2014 thru July 2017.

The following sections summarize the existing flow and loads to the WWTF.

3.1 Flow Definitions

First, it is important to define key flow terms. The MPCA defines several flow conditions that are used to design process units. The existing system design and the capacities of existing process units reference the following flow conditions:

- Average dry weather (ADW) flow: ADW flow is defined as the flow that occurs during dry periods when the groundwater level is low or normal. This flow would include the normal sanitary sewer flows from homes, commercial establishments, public institutions, and any industrial facilities. This flow level normally becomes apparent in winter months (December, January, and February), when there is little to no inflow.
- Average wet weather (AWW) flow: AWW or peak month flow is the daily average flow for the 30 consecutive days with the highest precipitation for mechanical facilities. AWW of peak month flow is the daily average for the approximately 180 consecutive days between November 15 and March 15 and March 15 to November 15 for controlled discharge pond systems.
- Peak hourly wet weather (PHWW) flow: PHWW is the peak flow during the peak hour of the day at a time when the groundwater is high and a five-year, one-hour storm event is occurring. For the City of Foley, a five-year, one-hour storm event corresponds to a precipitation event of 1.7 inches in one hour (MPCA, 2002).
- Peak Instantaneous Wet Weather (PIWW) flow: PIWW is the peak instantaneous flow during the day at a time when the groundwater is high and a 25-year, one-hour storm even is occurring. For the City of Foley, a 25-year, one-hour storm event corresponds to a precipitation event of 2.3 inches in one hour (MPCA, 2002).

3.2 Infiltration and Inflow

Infiltration and Inflow (I/I) is essentially clean water that enters the collection system as a result of rainfall or elevated groundwater levels. The MPCA has established guidelines to assist in evaluating the extent of both infiltration and inflow by comparing average flows during periods of high groundwater levels with and without precipitation events to establish threshold values. If either inflow or infiltration is found to be excessive, the MPCA recommends an analysis to determine the feasibility of removing I/I.

3.2.1 Infiltration

Infiltration is groundwater that enters the collection system through defective pipes, pipe joints, and manholes. Infiltration occurs when groundwater is high and runoff is not occurring (i.e. not during a rain event). To determine the magnitude of the infiltration, the influent flow for a baseline condition must be compared with the influent flow during an infiltration condition. The baseline condition occurs when the groundwater is low and runoff is not occurring.

Groundwater would be expected to be high in the spring. The average infiltration conditions for 2015 and 2017 were determined by averaging the influent flows on days without precipitation during the wet period of March through June. The day prior to or following a precipitation event were excluded from the average to eliminate the time of concentration and differences in the recording of precipitation and flow. The averages for 2015 and 2017 are presented in Table 5, Table 6, and Table 7.

Table 5 – Infiltration Conditions for Birch Pond

	Infiltration Condition [a]	Base Condition [b]	
Year	Average Influent WW Flow (mgd)	Average Influent WW Flow (mgd)	Infiltration (mgd)
2015	0.109	0.082	0.028
2017	0.125	0.082	0.043

2016 excluded. Birch pond did not receive flow during April 2016.

[a] Infiltration conditions reflect average flow from March through June excluding days prior to or after precipitation events.

[b] Base conditions reflect ADW flow.

[c] Per Capita contribution calculated using current population of 2,718.

Table 6 – Infiltration Conditions for Golf Pond

	Infiltration Condition [a]	Base Condition [b]	
Year	Average Influent WW Flow (mgd)	Average Influent WW Flow (mgd)	Infiltration (mgd)
2015	0.187	0.160	0.027
2017	0.195	0.160	0.036

2016 excluded. Birch pond did not receive flow during April 2016.

[a] Infiltration conditions reflect average flow from March through June excluding days prior to or after precipitation events.

[b] Base conditions reflect ADW flow.

[c] Per Capita contribution calculated using current population of 2,718.

Table 7 – **Infiltration Conditions for Combined System**

Year	Infiltration Condition [a] Average Influent WW Flow (mgd)	Base Condition [b] Average Influent WW Flow (mgd)	Infiltration (mgd)	Per Capita Contribution During Infiltration Condition [c] (gpcd)
2015	0.296	0.242	0.055	20.2
2016	0.307	0.242	0.065	23.9
2017	0.321	0.242	0.079	29.1

[a] Infiltration conditions reflect average flow from March through June excluding days prior to or after precipitation events.

[b] Base conditions reflect ADW flow.

[c] Per Capita contribution calculated using current population of 2,718.

2016 was excluded from the individual average calculations for Birch Pond and Golf Pond due to all flow being sent to Golf Pond for several days during the infiltration condition.

Comparing the infiltration condition with the base condition for municipal flows, contribution from the largest evaluation period for infiltration appears to be approximately 43,000 gpd for Birch Pond, 36,000 gpd for Golf Pond, and a combined average of 79,000 gpd for the combined system. Infiltration is considered excessive if the average flow during periods with seasonal high groundwater exceeds 120 gallons per capita per day (gpcd) for base flow and infiltration. Assuming a population of 2,718, the per capita wastewater flow during a period of high groundwater (including industrial contributions) is 29.1 gpdc, which is below the excessive criterion threshold.

3.2.2 Inflow

Inflow is rainfall contribution from sources such as flooded manhole covers, roof drains, foundation drains, storm water collection system cross connections, and other drain areas. Inflow occurs when groundwater is average or low and runoff is occurring (i.e. during a rain event).

Table 8, Table 9, and Table 10 summarize the five days with the highest total rainfall during the spring, summer, or fall from July 2014 through July 2017. Winter was excluded due to freezing precipitation. The wastewater flows during high precipitation events are compared with the average wastewater flows during the precipitation event month. The maximum inflow for Birch Pond was 79,000 gpd, which occurred on August 29, 2016. The maximum inflow for Golf Pond was 434,000 gpd, which occurred on July 11, 2016. The maximum inflow for Birch and Golf Ponds combined was 510,000 gpd, which occurred on July 11, 2016.

Table 8 – **Inflow Conditions for Birch Pond**

Date of Precipitation	Amount of Precipitation (inches)	Inflow Event [a]	Average Month	Inflow (mgd)
		Influent WW Flow (mgd)	Influent WW Flow (mgd)	
8/29/16	5.06	0.211	0.132	0.079
7/11/16	4.97	0.218	0.142	0.076
6/14/16	2.30	0.140	0.114	0.026
7/15/15	1.90	0.209	0.149	0.059
7/17/17	1.87	0.138	0.106	0.032

[a] Inflow Conditions summarizes the five days with the highest total rainfall during the spring, summer, or fall from July 2014 thru July 2017. Winter (December, January, and February) was excluded due to freezing precipitation.

[b] Average month flow for the month the event occurred.

[c] Per Capita contribution calculated using current population of 2,718.

Table 9 – **Inflow Conditions for Golf Pond**

Date of Precipitation	Amount of Precipitation (inches)	Inflow Event [a]	Average Month	Inflow (mgd)
		Influent WW Flow (mgd)	Influent WW Flow (mgd)	
8/29/16	5.06	0.449	0.259	0.190
7/11/16	4.97	0.694	0.260	0.434
6/14/16	2.30	0.447	0.195	0.252
7/15/15	1.90	0.594	0.289	0.305
7/17/17	1.87	0.220	0.175	0.045

[a] Inflow Conditions summarizes the five days with the highest total rainfall during the spring, summer, or fall from July 2014 thru July 2017. Winter (December, January, and February) was excluded due to freezing precipitation.

[b] Average month flow for the month the event occurred.

[c] Per Capita contribution calculated using current population of 2,718.

Table 10 – **Inflow Conditions for Combined System**

Date of Precipitation	Amount of Precipitation (inches)	Inflow Event [a] Influent WW Flow (mgd)	Average Month Influent WW Flow (mgd)	Inflow (mgd)	Per Capita Contribution During Infiltration Condition [c] (gpcd)
8/29/16	5.06	0.660	0.390	0.270	99.2
7/11/16	4.97	0.912	0.402	0.510	187.8
6/14/16	2.30	0.587	0.309	0.278	102.4
7/15/15	1.90	0.802	0.438	0.365	134.2
7/17/17	1.87	0.358	0.281	0.077	28.3

[a] Inflow Conditions summarizes the five days with the highest total rainfall during the spring, summer, or fall from July 2014 thru July 2017. Winter (December, January, and February) was excluded due to freezing precipitation.

[b] Average month flow for the month the event occurred.

[c] Per Capita contribution calculated using current population of 2,718.

Inflow is considered excessive if the flow during periods of significant rainfall exceeds 275 gpcd for domestic and industrial base flow plus infiltration and inflow. Assuming a population of 2,718, the maximum per capita wastewater flow during a period of increased precipitation (including industrial contributions) is 187.8 gpcd, which is below the excessive criterion threshold.

3.2.3 Infiltration and Inflow Correction

Foley has been working to reduce system I/I for several years. They have installed flow metering in the collection system, which amongst other purposes, assist in identifying I/I in the influent to Birch and Golf Ponds.

The City Council has implemented an inflow and infiltration reduction ordinance. As part of the ordinance, all residences and businesses in the city will be inspected for compliance with the new ordinance requirements. As part of the ordinance enforcement, financial penalties will be applied to owners who are found non-compliant with requirements. As a result nearly all connections are now compliant with requirements. Approximately 20 connections have not been inspected at the time of this report, however they are scheduled for compliance inspection within the next fiscal period.

Appendix D contains a copy of the City of Foley's sewer ordinance.

3.3 Current Wastewater Flows

Historical flow and load records from July 2014 through July 2017 (review period) are summarized in Appendix E Historical Influent Flows and Loads Summary. The reported flows are measured with magnetic flow meters installed in meter vaults located adjacent to Birch Lift Station near Birch Pond and Broadway Lift Station located northwest of Golf Pond (see Figure 1). These measurements represent the total flow to the facility, including I/I and industrial contributions. Over the review period, the average dry weather influent flow was 0.242 mgd, with a peak month flow 0.444 mgd to Birch and Golf Ponds combined. Based on a population of 2,718, the average dry weather flow corresponds to a per capita flow of 89 gpcd. Table 11 summarizes the current flows to the treatment facility which currently has a controlled discharge. Table 12 summarizes the current flows if the treatment facility was a continuous discharge, mechanical facility. As discussed in Section 3.1, the AWW is calculated different for controlled discharge pond systems and continuous discharge mechanical facilities. The greatest maximum day flow from July 2014 through July 2017 was 1.698 mgd on November 29, 2016.

Table 11 – **Current Wastewater Flows (Controlled Discharge, Pond)**

Condition	Birch Current Flow (mgd)	Golf Current Flow (mgd)	Combined Current Flow (mgd)
Average Dry Weather (ADW)	0.082	0.160	0.242
Average Wet Weather (AWW) [a]	0.166	0.195	0.361
Maximum Day Flow [b]	1.434	1.134	1.698
Peak Hourly Wet Weather (PHWW) [c]	0.582	0.683	1.265
Peak Instantaneous Wet Weather (PIWW) [d]	1.123	1.584	2.592

[a] Average wet weather occurred May 15, 2016 thru November 15, 2016 when 30.97" of rain fell during the approximate 180 day period.

[b] Maximum day flow occurred to Birch Pond November 29, 2016. Maximum day flow occurred to Golf Pond July 12, 2016. Maximum flow occurred to the combined ponds November 29, 2016.

[c] Peak hour wet weather flow determined by 10 States Standards peaking factor corresponding to a service population of 2,718.

[d] Peak instantaneous wet weather flow based on max pump capacity of lift stations in collection system.

Table 12 – **Current Wastewater Flows (Continuous Discharge, Mechanical Facility)**

Condition	Current Flow (mgd)
Average Dry Weather (ADW)	0.242
Average Wet Weather (AWW) [a]	0.435
Maximum Day Flow [b]	1.698
Peak Hourly Wet Weather (PHWW) [c]	1.521
Peak Instantaneous Wet Weather (PIWW) [d]	2.110

[a] Average wet weather occurred August 10, 2016 thru September 8 when 10.75" of rain fell during a 30 day period

[b] Maximum day flow occurred on November 29, 2016.

[c] Peak hour wet weather flow determined by 10 States Standards peaking factor corresponding to a service population of 2,718.

[d] Peak instantaneous wet weather flow based on max pump capacity of lift stations in collection system.

Peak hourly wet weather (PHWW) and peak instantaneous wet weather (PIWW) flows are also important for unit process capacity determination. Flow and precipitation data is required for determining the PHWW and PIWW flows. Peak instantaneous flow data is not available as flow is measured after pumping from the collection system's two lift stations. Instantaneous precipitation data is not available in Foley. The peak instantaneous flow value should also serve as an indicator for the maximum flow of the WWTF influent pumps. The maximum pumping rate for Birch Lift Station is 615 gpm operating one pump and 780 gpm operating both pumps in the duplex station. The maximum pumping rate for Broadway Lift Station is 850 gpm operating one pump and 1,100 gpm operating both pumps in the duplex station. The current lift stations have a combined peak pumping capacity of 1,465 gpm firm pump capacity, and 1,880 gpm with all pumps in operation without having issues. For the purpose of this design report, a PIWW flow of 2.110 mgd will be used, however it is recommended additional flow monitoring be conducted to refine the PIWW flow for design.

In addition to flow data, Table 13 shows the organic, solids, and phosphorus loading from July 2014 through July 2017. Monthly organics loading, analyzed as 5-day carbonaceous biochemical oxygen demand ($cBOD_5$), averaged approximately 567.7 pounds per day for Birch and Golf Ponds combined over the period, with a maximum load of 971 pounds per day (including industrial load) for Birch and Golf Ponds combined. The $cBOD_5$ concentration averaged 162.7 mg/L for Birch and Golf Ponds combined over the review period.

Monthly solids loading, analyzed as total suspended solids (TSS), average approximately 476.5 pounds per day for Birch and Golf Ponds combined over the review period. The greatest maximum daily TSS load was 1,567.9 pounds per day (including industrial load) for Birch and Golf Ponds combined. The TSS concentration averaged 136.6 mg/L for Birch and Golf Ponds combined over the review period.

Total phosphorus loadings, averaged approximately 15.8 pounds per day to Birch and Golf Ponds combined over the review period. The greatest maximum phosphorus load was 34.4 pounds per day for Birch and Golf Ponds combined. The phosphorus concentration averaged 4.54 mg/L for Birch and Golf Ponds combined over the review period.

Table 13 – **Current Domestic Mass Loading (Excluding Low Strength Waste from PouchTec)**

July 2014 thru July 2017 Loadings	Domestic Loading (lb/day)			Calculated Per Capita Load [a] (ppcd)
	Birch Pond [b]	Golf Pond	Combined	
$cBOD_5$, Average Load	183.0	384.7	567.7	0.21
TSS, Average Load	172.6	303.9	476.5	0.18
Total P, Average Load	5.1	10.8	15.8	0.006

[a] Based on a current population of 2,718

[b] Calculated from Birch Pond influent loads minus PouchTec

The actual per capita cBOD5 load is 0.21 pounds per capita day (ppcd). According to the Recommended Standards for Wastewater Facilities (Ten States Standards), the design of domestic waste shall be based upon at least 0.17 ppcd $cBOD_5$, or 0.22 ppcd where garbage comminutors are commonly used. The actual $cBOD_5$ per capita loading will be used for projecting future loads from the community.

The actual per capita TSS load is 0.18 ppcd. According to the Ten States Standards, the design of domestic waste treatment shall be based upon at least 0.20 ppcd TSS, or 0.25 ppcd where garbage disposals are commonly used. The suggested 0.20 ppcd TSS will be used for projecting future TSS loads to the community.

The actual per capita total phosphorus load in 0.006 ppcd. According to Wastewater Engineering Treatment and Reuse (Metcalf and Eddy, 2003), the typical range for per capita wastewater loading of total phosphorus is 0.006 to 0.010 ppcd. The actual total phosphorus per capita loading will be used for projecting future loads from the community.

Historical flows and loads from the community's SIU, PouchTec, were also evaluated from December 2014 through July 2017. Table 13 summarizes the current average daily flows and loads for the industrial facility. PouchTec has the ability to separate high and low strength waste flow. Table 14 represents only the low strength portion of the waste stream. PouchTec currently hauls its high strength waste stream to St. Cloud for treatment and disposal.

Table 14 – **Low Strength Waste from PouchTec, Flows, and Mass Loadings**

December 2014 thru July 2017 Flows and Loadings	Average Day
Flow, gpd	16,400
$cBOD_5$, lbs/day	68.0
TSS, lbs/day	21.8
Total P, lbs/day	0.9

3.4 Design Values

For facility plans, the MPCA prescribes specific design parameters. Specifically, the four flow conditions, defined in Section 3.1, must be established for the planning period. These flow conditions are used to quantify the range of flows observed and provide a basis for future planning. Population projections are also important to assess the requirements of new or existing treatment processes. The flow conditions, described below, account for future population growth and industrial expansion. Additional design capacity for institutional, high-density residential, medical, commercial, and industrial users are anticipated and described in greater detail in the Additional Design Capacity section of this report.

3.4.1 Planning Period

The typical planning period for collection system infrastructure is 50 to 70 years and 20 years for wastewater treatment facilities. The future capacity of the WWTF will be based upon either:

- Projections of flow and load to the year 2040, which will be considered the design year, or
- The existing permitted capacity of the WWTF.

3.4.2 Design Population

The current population of Foley is 2,718 based on State projections and recent censuses. Three growth scenarios were evaluated in determining a 2040 growth projection. Figure 4 illustrates the three population growth scenarios evaluated for Foley, MN. Foley experienced a sharp population growth between 2000 and 2005. The high growth scenario assumes that the growth during this time is typical and will continue during the planning period. The medium growth scenario excludes 2000 and 2001 from the population projection, which assumes that growth during the five year period was above average. Excluding 2000 and 2001 reduces the influence the above average population growth has on the population projection. The low growth scenario excludes 2000 to 2005 as atypical and not representative of anticipated future growth during the planning period.

3.4.2.1 High Growth Scenario

In the high growth scenario population growth in the community continues along a linearized average of the historical population growth from 2000 until 2016. The high growth scenario corresponds to a 2040 population of 3,451, or approximately 296 new households using the MN State Demographic Centers average 2.48 residents per household for Foley, MN.

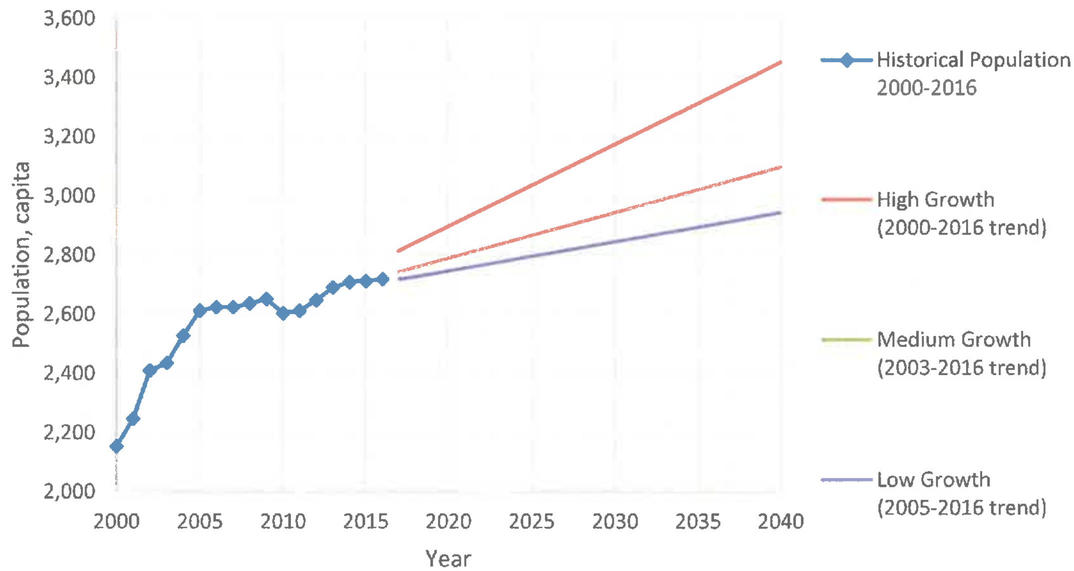
3.4.2.2 Medium Growth Scenario

In the medium growth scenario population growth in the community continues along a linearized average of the historical population growth from 2003 until 2016. The medium growth scenario corresponds to a 2040 population of 3,098, or approximately 153 new households using the MN State Demographic Centers average 2.48 residents per household for Foley, MN.

3.4.2.3 Low Growth Scenario

In the low growth scenario population growth in the community continues along a linearized average of the historical population growth from 2005 until 2016. The low growth scenario corresponds to a 2040 population of 2,944, or approximately 91 new households using the MN State Demographic Centers average 2.48 residents per household for Foley, MN.

Figure 4 – **Historical Population and Growth Projections for Foley, MN**



3.4.3 Additional Design Capacity

In addition to residential household growth, the community of Foley is planning for future development of institutional, high-density residential, medical, commercial, and industrial facilities. Additional capacity for the following land uses were evaluated separately for whether a pond system or a mechanical system were to be constructed. Additional capacity for the treatment alternatives were considered separately to maintain a consistent future design flow given the differences in calculating AWW flow. Additional capacity wastewater sources determined by the City to likely develop within the planning period include senior housing units, apartment units, assisting living units, medical clinic, wet industry, dry industry, and retail/commercial. Table 15 summarizes the flow and load contribution per unit of measure for each of the identified wastewater sources.

Consideration will also be made for flow and load received from PouchTec. A high-strength and low-strength scenario will be developed for future flows and loads.

3.4.3.2 Continuous Discharge System

A continuous discharge mechanical facility alternative 2040 projected flows and loads include the following growth assumptions for the following additional capacity wastewater sources:

- 25 unit senior housing complex
- 25 unit apartment complex
- 25 bed assisted living facility
- 4 practitioner clinic
- 1 wet industry
- 15 acres of light/medium industries
- 20 acres of retail/commercial businesses

Additional capacity required for the uses described above are summarized in Table 17. The anticipated flows and loads were determined during a literature review and based upon historical flow and load wastewater characteristics for Foley.

Table 17 – 2040 Additional Capacity for Development for Continuous Discharge Alternative

Wastewater Source	Average Day Flow and Load			
	Flow (gpd)	$cBOD_5$ (lb/day)	TSS (lb/day)	TP (lb/day)
Senior Housing	3,000	5.3	4.1	0.139
Apartments	3,000	5.3	4.1	0.139
Assisted Living Facility	3,000	5.3	4.1	0.139
Clinic	250	0.4	0.3	0.012
Wet Industry	25,000	120.0	84.0	1.500
Dry Industry	22,500	39.6	31.0	1.045
Retail/Commercial	27,500	66.0	76.0	1.277
Total	**84,250**	**241.8**	**203.8**	**4.251**

Table 15 – **Additional Capacity for Development Flow and Load per Unit of Measure**

Wastewater Source	Unit of Measure	Average Day Flow and Load per Unit			
		Flow (gpd)	$cBOD_5$ (lb/day)	TSS (lb/day)	TP (lb/day)
Senior Housing (unit)	Unit	120	0.21	0.17	0.006
Apartments (unit)	Unit	120	0.21	0.17	0.006
Nursing Home (beds)	Bed	120	0.21	0.17	0.006
Clinic (4 practitioners)	Practitioner	250	0.44	0.34	0.012
Wet Industry (facility)	Facility	25,000	120	84	1.50
Dry Industry (acre)	Acre	1,500	2.64	2.07	0.070
Retail/Commercial (acre)	Acre	1,375	3.30	3.80	0.064

3.4.3.1 Controlled Discharge System

A controlled discharge pond facility alternative 2040 projected flows and loads include the following growth assumptions for the following additional capacity wastewater sources:

- 55 unit senior housing complex
- 65 unit apartment complex
- 75 bed assisted living facility
- 4 practitioner clinic
- 1 wet industry
- 40 acres of light/medium industries
- 40 acres of retail/commercial businesses

Additional capacity required for the uses described above are summarized in Table 16. The anticipated flows and loads were determined during a literature review and based upon historical flow and load wastewater characteristics for Foley.

Table 16 – **2040 Additional Capacity for Development for Controlled Discharge Alternative**

Wastewater Source	Average Day Flow and Load			
	Flow (gpd)	$cBOD_5$ (lb/day)	TSS (lb/day)	TP (lb/day)
Senior Housing	6,600	11.6	9.1	0.306
Apartments	7,800	13.7	10.8	0.362
Assisted Living Facility	9,000	15.8	12.4	0.418
Clinic	250	0.4	0.3	0.012
Wet Industry	25,000	120.0	84.0	1.500
Dry Industry	60,000	105.5	82.7	2.786
Retail/Commercial	55,000	132.0	152.0	2.553
Total	**163,650**	**399.1**	**351.3**	**7.937**

3.4.3.3 PouchTec

The future flow and load conditions will include an anticipated increase in discharge flow and low of the low-strength industrial waste currently being treated by the municipal wastewater pond system. A second future condition will reflect the additional flow and load if the City were to receive both high- and low-strength wastewater from PouchTec. Table 18 presents the future projected flow and loads for both industrial wastewater discharge conditions.

Table 18 – **2040 Additional Capacity for PouchTec Alternatives**

Wastewater Source	Average Day Flow and Load			
	Flow (gpd)	$cBOD_5$ (lb/day)	TSS (lb/day)	TP (lb/day)
PouchTec Low-Strength	32,700	136	0	1.89
PouchTec High-Strength	2,200	550	0	4.00
Total	**34,900**	**686**	**0**	**5.89**

3.4.4 2040 Design Flow and Load Projections

The historical flow data from July 2014 through July 2017 was used to help determine the 20-year projected flows and loads. The MPCA flow determination worksheet for the 20-year design period is included in Appendix F. The projected combined average wet weather flow for 2040 is 0.570 mgd for a controlled discharge pond and for a continuous discharge mechanical treatment facility. The four projected flow conditions for 2040 are reported in Table 19 for a controlled discharge pond and Table 20 for a continuous discharge mechanical facility. The low growth scenario was selected for design. The design flow conditions therefore account for a 2040 service population of 2,944. 2040 design flows and loads include low strength industrial wastewater from PouchTec, additional development capacity, and projected population growth.

Table 19 – **2040 Design Wastewater Flows with Low-strength PouchTec Wastewater (Controlled Discharge, Pond)**

Condition	Low-Strength			High- and Low-Strength		
	Birch Flow (mgd)	Golf Flow (mgd)	Combined Flow (mgd)	Birch Flow (mgd)	Golf Flow (mgd)	Combined Flow (mgd)
Average Dry Weather (ADW)	0.162	0.289	0.451	0.164	0.289	0.453
Average Wet Weather (AWW)	0.264	0.304	0.568	0.266	0.304	0.570
Peak Hourly Wet Weather (PHWW)[a]	0.911	1.048	1.959	0.919	1.048	1.967
Peak Instantaneous Wet Weather (PIWW)[b]	1.217	1.716	2.932	1.217	1.716	2.932

Future design capacity is added to Birch and Golf proportional to their current flows.

[a] Peaking factor of 3.4 used from Table 1 in 10 States Standards with a 2040 design population of 2,944. PouchTec high-strength wastewater flow is not included in peaking factor calculation.

[b] PIWW flow based on current lift station pump capacity with both duplex pump operating. Future projection base on increase in service population.

Table 20 – 2040 Design Wastewater Flows (Continuous Discharge, Mechanical Facility)

Condition	Low-Strength Flow (mgd)	High- and Low-Strength Flow (mgd)
Average Dry Weather (ADW)	0.359	0.361
Average Wet Weather - (AWW)	0.568	0.570
Peak Hourly Wet Weather (PHWW) [a]	1.959	1.966
Peak Instantaneous Wet Weather (PIWW) [b]	2.932	2.932

[a] Peaking factor of 3.4 used from Table 1 in 10 States Standards with a 2040 design population of 2,944. PouchTec high-strength wastewater flow is not included in peaking factor calculation.

[b] PIWW flow based on current lift station pump capacity with both duplex pump operating. Future projection base on increase in service population.

Wastewater loads were also projected for the 20-year design period and are summarized in Table 21. The design loadings include $cBOD_5$, TSS, and Total P. Peak month as day was determined using peaking factors and applied to the combined load. Peak month as day loads for each pond were calculated based on the proportion of average day load received by each pond. Peaking factors were calculated using the sum of the average and standard deviation from historical load data during the review period as influent sampling was only conducted once per month. Peak loadings are also reported in Table 21.

In addition, PouchTec also produces a high-strength waste stream, which is currently separated from the waste stream being discharged to the City of Foley, and is hauled to St. Cloud for treatment and disposal. The waste stream is principally high in $cBOD_5$ and used in St. Cloud to supplement digestion for biogas production. A scenario where both low- and high-strength waste are discharged to the City will also be considered as a design scenario in this report. Any wastewater discharged by PouchTec to the City is treated by the Birch Pond system, therefore loading to Golf would not change for this scenario. The 2040 projected flow from PouchTec's high-strength waste stream is 2,200 gallons per day. Table 22 provide average and peak loads for Birch Pond and the Combined System if PouchTec's high strength flow is discharged to the City.

Table 21 – **2040 Design Wastewater Loads with Low-strength PouchTec Wastewater (Controlled Discharge, Pond)**

Parameter	Peaking Factor	Low-Strength		High- and Low- Strength	
		Day Average	Peak Month as Day	Day Average	Peak Month as Day
Combined - Birch Pond and Golf Pond					
$cBOD_5$ Loading, lbs/day		463	583	1,013	1,314
TSS Loading, lbs/day		358	566	358	565
Total P Loading, lbs/day		9.90	13.56	13.90	19.04
Combined - Birch Pond and Golf Pond					
$cBOD_5$ Loading, lbs/day		687	866	687	866
TSS Loading, lbs/day		553	874	553	874
Total P Loading, lbs/day		17.08	23.4	17.08	23.4
Combined - Birch Pond and Golf Pond					
$cBOD_5$ Loading, lbs/day	1.26	1,150	1,449	1,730	2,180
TSS Loading, lbs/day	1.58	911	1,439	911	1,439
Total P Loading, lbs/day	1.37	26.98	36.96	30.98	42.44

Table 22 – **2040 Design Wastewater Loads with Low-strength PouchTec Wastewater (Continuous Discharge, Mechanical)**

Parameter	Peaking Factor	Low-Strength		High- and Low- Strength	
		Day Average	Peak Month as Day	Day Average	Peak Month as Day
Combined - Birch Pond and Golf Pond					
$cBOD_5$ Loading, lbs/day	1.26	993	1,251	1,597	2,012
TSS Loading, lbs/day	1.58	763	1,206	763	1,206
Total P Loading, lbs/day	1.37	23.25	31.85	27.30	37.40

4 Existing Facilities

The City of Foley operates a controlled discharge pond municipal wastewater treatment facility to treat wastewater generated within the City. Each pond is supplied flow from an influent lift station. Birch Lift Station primarily provides flow to Birch Pond, and Broadway Lift Station primarily provides flow to Golf Pond, however each lift station is piped to discharge to either Pond. The facility operates two pond systems, Birch Pond consisting of one primary and one secondary cell, and Golf Pond consisting of two primary and one secondary cell. The ponds are located within the municipal boundary of Foley as shown in Figure 1. Access to Birch pond is attained from Oak Drive, through Lion's Park, and access to Golf Pond is attained from 55th Street South (County Highway 51), through the municipal yard waste site.

4.1 100 Year Flood Elevation

The existing pond system is located adjacent to Stoney Brook, as shown in Appendix G. The flood zone adjacent to the pond system is Zone A, and Flood Insurance Study for the County does not include Stoney Brook. The top elevation for embankment walls at Birch Pond is approximately 1,112 ft, and approximately 1,117 ft for Golf Pond. Birch Lift Station is located east of Birch Pond in Lion's Park and is with a top of casting elevation at approximately 1,121 ft. Broadway Lift Station is located north of Golf Pond near the previous wastewater treatment facility prior to the treatment ponds being constructed with a top of casting elevation at approximately 1,108 ft.

The Federal Emergency Management Agency (FEMA) has produced Flood Insurance Rate Maps (FIRMs) for Foley indicating Zone A flood plains along Stoney Brook. Birch Lift Station, Broadway Lift Station, and Golf Pond are located outside of the Zone A area indicated on the FIRM. Both the primary and secondary cells of Birch Pond are located within the Zone A area. These maps can be found in Appendix G.

Zone A is defined by FEMA as an area subject to inundation by the 1-percent-annual-chance flood event generally determined using approximate methodologies. Because detailed hydraulic analysis have not been performed, no Base Flood Elevations (BFEs) or flood depths are shown. Mandatory flood insurance purchase requirements and floodplain management standards apply.

Several state agencies govern activities in the flood plain:

- Under the Minnesota statewide floodplain management standards, local communities cannot allow development in the floodway that would cumulatively cause more than six inches increase in the height of the 199-year flood (MN DNR). Development normally allowed in the flood fringe provided that the buildings are placed on fill so that the lowest floor, including the basement, is above the 100-year flood level.
- Minnesota Building Code §6120.5800 requires public utility facilities within the floodplain to be designed to minimize increases in flood elevations and be compatible with existing local comprehensive floodplain development plans. Where failure or interruption of the public facility results in danger to the public health or safety, protection to the flood protection elevation shall be provided. The flood protection elevation is defined as an elevation one foot above the 100-year flood. The elevation of the lowest floor of a dwelling must be at or above the flood protection level. Local regulations will also require the access road elevation to within two feet of the flood protection elevation.
- MPCA design guidelines for wastewater treatment facilities require treatment plant structure and electrical and mechanical equipment to be protected from physical damage by the 100-year flood. Additionally, treatment plants should remain fully operational and accessible during the 25-year flood. These requirements apply to new construction and to existing facilities undergoing major modification.

If new facilities are constructed in the floodplain, hydraulic modeling and coordination with the Minnesota Department of Natural Resources (MN DNR) are required to confirm that the new facilities do not result in a flood elevation change more than six inches. To avoid this, it is recommended that any new facilities be located outside the 100-year flood elevation.

4.2 Wastewater Treatment Facilities

The City of Foley operates two controlled discharge treatment ponds. Birch Pond was originally constructed in 1965, and Golf Pond was added in 1990. Prior to Birch pond, the City operated a mechanical treatment facility located directly north of Broadway Lift Station. The current facilities are designed to treat a combined flow of 371,300 gallons per day. Site plans for Birch Pond and Golf Pond are included in Figure 2 and 3 respectively.

The facility is considered a Class D facility. This classification comes from Minnesota Administrative Rule 9400.0500, which defines a scoring system assigning facilities to Classes A, B, C, or D. With this classification, the facility must be operated by an operator who is certified to operate a Class D facility.

The following sections describe and summarize the capacities of each existing treatment unit. Any treatment unit, whether for liquid or solids, can limit the capacity of a wastewater treatment facility. As effluent limits change, so do the design criteria for the unit processes. The wastewater treatment components were analyzed against the current flows and loads and the existing (March 2012) discharge permit. The capacity analysis use accepted design standards from the Recommended Standards for Wastewater Facilities (2014), often referred to as "Ten States Standards," the Fourth Edition of the Wastewater Engineering Treatment and Reuse text by Metcalf and Eddy (2003), and Water Environment Federation Manual of Practice No. 8.

Condition-related improvements are also identified in the following sections. Costs for these improvements, as well as recommendations for timing are presented. Much of the equipment for the influent lift station and treatment ponds is near or beyond their useful lifespan. Typically, equipment has a useful lifespan of 15 to 20 years. Thus, it is timely for the City to proactively plan for replacement and rehabilitation so that funds are available when the equipment can no longer meet its intended use. The equipment has served its intended use and the City staff has done a good job maintaining the equipment over the years. Typically, structures at WWTFs have a useful life of 50 to 75 years. Most of the structures appear to be in good condition, with some indicating moderate to significant degradation due to hydrogen sulfide. All structures should be examined by a structural engineer prior to a design and construction project.

4.2.1 Liquids Handling System

The Foley WWTF consist of two pond treatment systems. The ponds consist of a secondary cell and then either one or two primary cells. Alum is added for phosphorus precipitation between the primary and secondary cells. The following paragraphs first describe Birch Pond an then Golf Pond, including influent lift stations.

4.2.1.1 Birch Pond

Birch Pond consists of a two-cell stabilization pond system which has a controlled discharge to a marsh to Stoney Brook. The facility is designed to treat an average influent flow of up to 161,000 gallons per day with a $cBOD_5$ influent concentration of 290 mg/L. The pond system is designed for a total detention time of 180 days at design flow.

Current calendar average flow for Birch Pond from July 2014 thru July 2017 was 121,000 gallons per day, with an AWW flow of 166,000 gallons per day. The pond is near capacity at existing conditions and insufficient for the 2040 projected AWW flow for Birch pond of 304,000 gallons per day. For non-aerated systems, primary treatment cells are designed for 180 days of detention time. At the 304,000 gallons per day future design condition, the pond system will provide 95 days of hydraulic detention time, which is insufficient.

4.2.1.1.1 Birch Lift Station

Birch Lift Station is located west of Birch Pond in Lion's Park. The lift station was constructed in 1976 and contains a precast concrete wet well, prefabricated steel drywell, and precast concrete valve vault. An insulated shelter with automatic sample was added in 2014 to facilitate influent sampling. Birch Lift Station contains two 7.5 HP pumps using 7-3/8 inch impellers. The pump motors are 3 phase, 60 amp, 230 volt, 1,760 rpm motors. The design condition used for the lift station is 330 gpm per pump, operating at 42 feet of total dynamic head. Under normal operation, the Birch lift station pumps influent to Birch Pond. Birch Lift Station may also be used to pump influent to Golf Pond through a second force main.

Figure 5 – **Birch Lift Station**

The existing dry well is a Smith and Loveless underground steel pump station. The underground station is a 7 foot diameter by 7 foot 6 inches tall and accessed by a 36 inch diameter by 7 foot entrance tube. Installed in 1976, the station has exceeded the typical 15-20 anticipated service life for pumps and valves. The structural components of the lift station have begun corroding. Cathodic protection on the exterior of the structure likely requires replacement to maintain corrosion protection.

The design guidelines require the lift station pump capacity to be based on peak instantaneous flow with the largest pump out of service. The current peak instantaneous flow for Birch Lift Station is 615 gpm with one pump in operation and 780 gpm with both pumps in operation.

4.2.1.1.2 Primary Treatment Cell A

The primary treatment cell was constructed in 1965. Two submerged influent pipes, one from Birch Lift Station to the west and the other from Broadway Lift Station to the north provide flow to the treatment cell. The minimum operating depth for the primary cell is 2 feet, with a maximum operating depth of 6 feet. The mean operating depth is 4 feet with a pond acreage at mean operating depth of 17.20 acres. The pond has a clay liner and solids have never been removed. The depth below ground surface of the water table at the pond is 2 feet. The primary cell is equipped with two solar operated SolarBee surface aerators.

For non-aerated systems, primary treatment cells are designed for 22 pounds per day of $cBOD_5$ loading per acre of surface area at mean operating depth. The Birch Pond primary treatment cell is then capable of treating approximately 389 pounds per day of $cBOD_5$. Current loading to the pond is 251 pounds per day of $cBOD_5$, with a 2040 design load of 501 pounds per day of $cBOD_5$ when receiving PouchTec's low strength industrial waste. The primary treatment cell is sufficient for current loading, but insufficient for future design conditions.

A sludge depth analysis was conducted to determine the actual capacity of the primary treatment cell as part of the Facilities Plan. The results of the sludge depth analysis can be found in Appendix H. The average sludge depth in the primary cell was 11.8-inches. The total sludge volume in the primary cell was approximately 26,800 cuyd.

4.2.1.1.3 Transfer Structure

The transfer structure is located between the primary and secondary cell of Birch Pond. The structure is located along the southeast side of the primary cell and southwest side of the secondary cell. The structure was constructed in 2010 and replaces the existing transfer structure which is abandoned-in-place immediately to the south.

Figure 6 – **Birch Pond Transfer Structure**

The transfer structure has a new aluminum hatch and level gauge. A new buried discharge plug valve is located to the east for control of flow between the cells.

4.2.1.1.4 Secondary Treatment Cell B

The secondary treatment cell was constructed in 1965. The minimum operating depth for the secondary cell is 2 feet, with a maximum operating depth of 6 feet. The mean operating depth is 4 feet with a pond acreage at mean operating depth of 5.00 acres. The pond has a clay liner and solids have never been removed. The depth below ground surface of the water table at the pond is 2 feet. The secondary cell is equipped with one solar operated SolarBee surface aerator.

4.2.1.1.5 Discharge Structure and Outfall

The discharge structure for Birch Pond is located on the northeast side of the secondary treatment cell. The structure is original to the pond construction in 1965. Since the original pond construction, the pond has been modified to increase the depth. The original overflow weir wall is still in the discharge structure, however the weir was been removed.

A buried plug valve located east of the discharge structure is used to control discharge flow.

The discharge pipe extends into a marshy area of Stoney Brook. The outfall pipe discharges directly into the marsh and does not have an apron or riprap.

Figure 7 – **Birch Pond Discharge Structure**

4.2.1.2 Golf Pond

Golf Pond consists of a three-cell stabilization pond system which has a controlled discharge to a ditch to Stoney Brook. The facility is designed to treat an average influent flow of up to 210,300 gallons per day with a $cBOD_5$ influent concentration of 207 mg/L. The pond system is designed for a total detention time of 180 days at design flow.

Current calendar average flow for Birch Pond from July 2014 thru July 2017 was 195,000 gallons per day. The pond is near capacity at existing conditions and insufficient for the 2040 projected AWW flow for Gold Pond of 264,000 gallons per day. For non-aerated systems, primary treatment cells are designed for 180 days of detention time. At the 264,000 gallons per day future design condition, the pond system does not provide sufficient hydraulic detention for treatment.

4.2.1.2.1 Broadway Lift Station

Broadway Lift Station is located northwest of Golf Pond near the City's maintenance garage and old mechanical wastewater treatment facility. The lift station was constructed in 1990 and contains a precast concrete wet well, prefabricated steel drywell, and precast concrete valve vault. An insulated shelter with automatic sample was added in 2014 to facilitate influent sampling. Broadway Lift Station contains two 15 HP pumps using 8-3/4 inch impellers. The pump motors are 3 phase, 60 amp, 230 volt, 1,760 rpm motors. The design condition used for the lift station is 800 gpm per pump, operating at 43 feet of total dynamic head. Under normal operation, the Birch lift station pumps influent to Golf Pond. Broadway Lift Station may also be used to pump influent to Birch Pond through a second force main.The existing dry well is a Smith and Loveless underground steel pump station. The underground station is an 8 foot diameter by 8 foot 6 inches tall and accessed by a 36 inch diameter by 11 foot 6 inch foot entrance tube. Installed in 1991, the station is near the typical 15-20 anticipated service life for pumps and valves. The structural components of the lift station have begun corroding. Cathodic protection on the exterior of the structure likely requires replacement to maintain corrosion protection.

The design guidelines require the lift station pump capacity to be based on peak instantaneous flow with the largest pump out of service. The current peak instantaneous flow for Broadway Lift Station is 850 gpm with one pump in operation and 1,100 gpm with both pumps in operation.

Figure 8 – Broadway Lift Station

4.2.1.2.2 Influent Structure

The Influent structure is located between the two primary treatment cells of Golf Pond. The structure was constructed in 1990 and shows extensive signs of concrete degradation. Reinforcing steel in the interior of the influent structure is exposed and weir plate frames are exposed due to deterioration of the concrete.

Figure 9 – **Golf Pond Influent Structure**

The influent structure also acts as a splitter stricter, with overflow weirs dividing influent flow between the two primary treatment cells. Stop plates can be inserted into frames to isolate a primary treatment cell if needed.

4.2.1.2.3 Primary Treatment Cells A and B

The primary treatment cells were constructed in 1990. The minimum operating depth for the primary cells are 2 feet, with a maximum operating depth of 6 feet. The mean operating depths are 4 feet with a pond acreage at mean operating depth of 8.26 acres per cell. The ponds are PVC lined and no solids have ever been removed. The depth below ground surface of the water table at the pond is 2 feet.

F For non-aerated systems, primary treatment cells are designed for 22 pounds per day of $cBOD_5$ loading per acre of surface area at mean operating depth. The Golf Pond primary treatment cells are then capable of treating approximately 363 pounds per day of $cBOD_5$. Current loading to the pond is 385 pounds per day of $cBOD_5$, with a 2040 design load of 768 pounds per day of $cBOD_5$. Golf pond does not receive PouchTec's low strength industrial waste. The primary treatment cell is insufficient for current loading and for future design conditions.

A sludge depth analysis was conducted to determine the actual capacity of the secondary treatment cell as part of the Facilities Plan. The results of the sludge depth analysis can be found in Appendix H. The average sludge depth in primary cells A and B was 7.4-inches and 8.0-inch respectively. The combined total sludge volume in the primary cells was approximately 17,100 cuyd.

4.2.1.2.4 Transfer Structure

The transfer structure is located between the primary cells and secondary cell of Golf Pond. The structure is located along the east side of the secondary cell and northwest/southwest corner of the primary cells. The structure was constructed in 1990 and controls transfer flow between both primary cells and the secondary cell.

Figure 10 – **Golf Pond Transfer Structure**

Overflow weirs between the cells have frames that stop plates can be inserted into to isolate a primary treatment cell if needed, and allow transfer flow from primary cells into the secondary cell. A plug valve located in the structure controls flow to the secondary treatment cell.

4.2.1.2.5 Secondary Treatment Cell C

The secondary treatment cell was constructed in 1990. The minimum operating depth for the secondary cell is 2 feet, with a maximum operating depth of 6 feet. The mean operating depth is 4 feet with a pond acreage at mean operating depth of 12.51 acres. The pond has a PVC liner and no solids have ever been removed. The depth below ground surface of the water table at the pond is 2 feet.

4.2.1.2.6 Discharge Structure and Outfall

The discharge structure for Golf Pond is located on the southwest side of the secondary treatment cell. The structure is original to the pond construction in 1990 and controls discharge of Golf Pond. A weir wall and frame allow for overflow discharge of the pond.

A valve located inside the structure is used to control discharge flow. The plug valve was also installed in 1990.

Figure 11 – **Golf Pond Discharge Structure**

The discharge pipe extends into riprap drainage channel to Stoney Brook. The outfall pipe discharges directly into the channel which also extends around the entirety of Golf Pond.

4.2.2 Solids Handling System

Wastewater treatment ponds provide in-situ treatment and storage of biosolids. Periodic removal of biosolids from the treatment ponds is required as solids accumulate in the treatment cells. Dredging frequency varies based on the treatment system and waste characteristics, and can include pumping off of liquid biosolids or allowing sludge to dry and then be removed. Accumulation of sludge can result in a decrease in storage volume in the pond system. Both Birch and Golf ponds have never had solids removed from them.

Minnesota Administrative Code 7041 and 40 Code of Federal regulation, chapter 503 regulate disposal methods based on sludge characteristics. Potential disposal methods and costs depend largely on the sludge characters. The MPCA recommends facilities planning for sludge removal activities consider a time frame of approximately two years to plan and complete projects. If all biosolids are to be removed, as with decommissioning for example, time needs to be provided for biosolids remaining after liquid removal to dry and be removed.

5 Alternative Evaluation

5.1 Impact of Future Flow and Loads

The current wastewater treatment ponds are at hydraulic capacity. In all projected flow and load scenarios, the hydraulic and organic capacity of the current treatment system is exceeded. The preliminary effluent limits have indicated that increasing hydraulic capacity of the treatment system will need to meet the same current mass load limits due to anti-degradation rules enacted by the State of Minnesota in 2016. The frozen mass limits results in a lower equivalent effluent concentration for all limited parameters.

Future expansion of the municipal wastewater treatment system will also be required to meet frozen mas limits, which challenge the attainable effluent waste quality achievable by a facultative pond treatment system.

5.2 Liquids and Solids Treatment

Liquid and solids treatment alternatives are evaluated in conjunction with one another as treatment alternatives for Foley vary largely in treatment approach between expansion of their current facultative pond system, to regionalization, and conversion to a continuous discharge facility.

The following sections will describe treatment alternatives and present preliminary engineer's opinion of probable costs that may be used for an economic comparison of treatment alternatives. The capital costs shown are project costs that include engineering and administrative costs. The O&M costs shown include the costs associated with labor, utilities, chemicals, and maintenance/repairs and is used for comparison purposes only.

5.2.1 Stabilization Pond Expansion

The stabilization expansion alternative involves the construction of a third facultative wastewater pond system on City owned property south of the existing Golf Pond system. The new pond system would include an expansion of the Birch Pond Lift Station, a new influent splitter structure near Golf Pond, two new primary treatment cells, new control structures, and discharge structure at the Golf Pond discharge.

The expanded Birch Pond lift station would include additional pumps to divert flow above Birch Pond influent capacity to the new splitter structure near Golf Pond. A new splitter structure near Golf Pond would split flow between Golf Pond and the new pond treatment train.

Any pond expansion alternative would require additional study for locating the pond system, land acquisition, and site suitability. Initial indications show that there may not be enough land available for the require pond area. The low-strength waste alternative would require 35.07 acres of pond surface while the high- and low-strength alternative would require 72.59 acres of pond surface. The proximity to Stoney Brook also indicates the need to better understand water table depth to maintain 3 vertical feet of separation between the pond system and groundwater table.

The size of the new treatment system varies based on the discharge scenario. Accepting PouchTec low-strength wastewater contributes an additional 514.34 ppd $cBOD_5$, corresponding to 23.38 additional acres of primary cell using the MPCA Recommended Pond Design Criteria loading of 22 lbs $cBOD_5$ per acre. Secondary treatment cell volume is based on the larger of two scenarios: the additional volume required for all cells to hold 180 days of storage, or one-third of the combined volume of primary treatment cells. The secondary pond cell would be 11.69 acres limited proportionally to the primary treatment cells. Accepting high- and low-strength wastewater contributes an additional 1,064.62 ppd $cBOD_5$, corresponding to 48.39 additional acres of primary cell. The secondary pond cell would be 24.20 acres limited proportionally to the primary treatment cells. Construction for either project would require land acquisition and wetland relocation. Approximately 1.36 acres of palustrine, emergent, semi-permanent, partially drained wetland (PEMFd) and 6.83 acres of palustrine, emergent, type 2 wet meadow, partially drained wetland (PEMBd) would need to be relocated for pond construction.

As part of the improvement project, a new HDPE pond liner would be installed in Birch Pond to reduce leaking to within acceptable rates. For liner installation, sludge would be removed from Birch Pond to facilitate construction. The influent structure for Golf Pond would also be replaced, as it has significant degradation. A coating system will be added to the new influent structure for added corrosion resistance.

Phosphorus removal is achieved by broadcasting coagulant from a boat into the pond secondary treatment cells. The addition of coagulant would also assist in TSS and $cBOD_5$ limits; however, the preliminary effluent limit corresponds to an effluent $cBOD_5$ concertation between 15 and 16mg/L which may not reliably be achieved with only a stabilization pond system.

Table 23 summarizes the preliminary engineer's opinion of probable costs for the stabilization pond expansion alternative proposed for Foley. Expanding the existing pond treatment system will likely require a Class D operator license.

Table 23 – **Probable Cost for Stabilization Pond Expansion**

Alternative	Preliminary Engineer's Opinion of Probable Cost		
	Capital Cost	Annual O&M Cost	20 Year Present Value [a]
Stabilization pond expansion with low-strength waste.	$16,403,000	$100,700	$17,901,000
Stabilization pond expansion with high- and low-strength waste.	$27,982,000	$100,700	$29,480,000
[a] 20 year period at 3.0% rate.			

5.2.2 Package Mechanical Treatment Plant

The package mechanical treatment plant alternative would involve the decommissioning of both Birch and Golf ponds and construction of a continuous discharge mechanical treatment facility. Package plants are typically provided by a single vendor and consist of modular compartments designed to meet a given water effluent quality. With most package plant system, preliminary treatment still needs to be provided separate from the package plant. Package plants include sludge stabilization, however supplemental storage, dewatering, and disposal will usually need to be provided. Disinfection will also need to be provided after treatment.

The package plant alternative proposed for Foley consists of:

- A standalone preliminary treatment system consisting of preliminary treatment building, mechanically cleaned screen, manually raked screen in bypass channel, and grit removal.
- Package plant treatment system including an anaerobic selector, activated sludge basin with biological phosphorus removal, aerobic digester, and final clarifier.
- Ultraviolet disinfection building which also contains process blowers, electrical room, and chemical feed equipment.
- Biosolids dewatering building with cake conveyance and dewatering equipment.
- Cake storage pad.
- Rehabilitation/Modification of Birch and Broadway Lift Stations including pumps.

The mechanical package plant alternative will result in decommissioning of Birch and Golf ponds. Decommissioning includes sludge removal and disposal, and demolition of the pond structures. .

Table 24 summarizes the preliminary engineer's opinion of probable costs for the package mechanical treatment plant alternative proposed for Foley. Converting to a mechanical package plant will likely require a Class A or B operator license.

Table 25 – **Probable Cost for Aerated Pond System**

Alternative	Preliminary Engineer's Opinion of Probable Cost		
	Capital Cost	Annual O&M Cost	20 Year Present Value [a]
Aerated pond system with low-strength waste.	$7,387,000	$214,000	$10,571,000
Aerated pond system with high- and low-strength waste.	$7,584,000	$224,700	$10,927,000
[a] 20 year period at 3.0% rate.			

5.2.4 Regionalization

Regionalization with the City of Saint Cloud would include constructing a new lift station and forcemain which would pump wastewater from Foley to the Saint Cloud collection system and ultimately the wastewater treatment facility for treatment. In this alternative, the Broadway and Birch Pond lift station pumps would be replaced to pump to a new lift station near Golf Pond. The new lift station would pump directly into a forcemain approximately 7.5 miles to a second lift station near Highway 23 between St. Cloud and Foley. The second lift station would then pump the remaining 4.0 miles to a gravity manhole located at Energy Drive and 35th Ave NE in the northeast corner of St. Cloud's collection system. The forcemain would mainly be located in the right-of-way associated with Hwy 23, however an alternate route between Foley and the intermediate lift station may follow an abandoned railroad bed. Figure 12 illustrates the preliminary forcemain alignment evaluated.

Table 24 – **Probable Cost for Package Mechanical Treatment Plant**

Alternative	Preliminary Engineer's Opinion of Probable Cost		
	Capital Cost	Annual O&M Cost	20 Year Present Value [a]
Mechanical package plant with low-strength waste.	$11,088,000	$281,300	$15,273,000
Mechanical package plant with high- and low-strength waste.	$11,650,000	$313,600	$16,316,000
[a] 20 year period at 3.0% rate.			

5.2.3 Aerated Pond System

The aerated pond system alternative would convert Golf Pond to an aerated pond by the addition of floating diffuser headers to the primary treatment cells. The floating headers provide access for maintenance and can adjusts for variable pond depth. The advantage for the aerated pond is that the facility would convert to a continuous discharge meaning that the current Golf Pond basins are well above the required volume to treat the current and future wastewater flows. The Birch pond system would no longer be needed and would be decommissioned. Locations can be provided along the floating aeration header for future laterals and diffusers to increase organic capacity accommodating future growth and the high- and low-strength industrial discharge.

The aerated pond alternative proposed for Foley consists of:

- Floating aeration headers on the primary treatment cells which connect to laterals extending to the bottom of the pond for diffusers.
- Ultraviolet disinfection.
- Chemical addition.
- Tertiary treatment in the form of earthen polishing reactors.
- Building to house electrical panels, blowers, chemical feed system, and UV disinfection.
- Rehabilitation/Modification of Birch and Broadway Lift Stations including pumps.

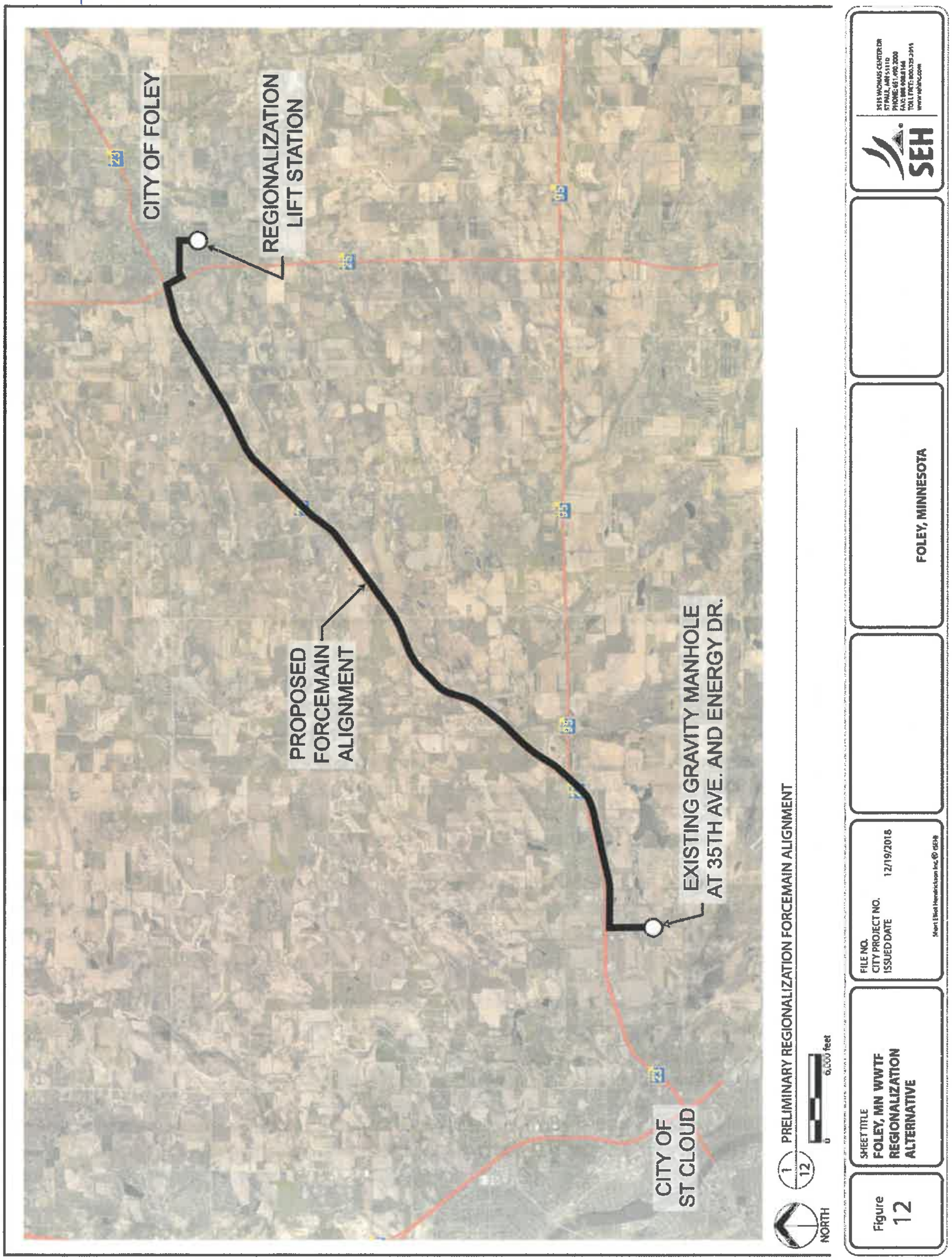
Phosphorus removal would be achieved by coagulant addition between the primary and secondary pond cells. Coagulant would be dosed at the transfer structure with solids allowed to flocculate and settle in the secondary treatment pond.

Tertiary treatment provides sufficient polishing to reduce TSS in wastewater effluent for $cBOD_5$ reduction. The evaluated tertiary treatment is a subsurface, horizontal flow, fixed film biological filter. Biological growth in the filter would also provide an additional step of $cBOD_5$ reduction.

The aerated pond conversion will result in decommissioning of Birch Pond and dredging of Golf Pond. Decommissioning includes sludge removal and demolition of the pond structures.

Table 25 summarizes the preliminary engineer's opinion of probable costs for the aerated pond alternative proposed for Foley. Converting to a mechanical package plant will likely require a Class C operator license.

Figure 12 – **Preliminary Regionalization Forcemain Alignment**



Each new lift station would be a submersible lift station with a set of dry and wet weather pumps. This is in response to the wide range between dry weather and peak wet weather flow rates and the high head requirements resulting from a long forcemain. A valve vault and meter vault in addition to the wetwell would connect into a 12-inch forcemain. The forcemain route requires seven air release and 10 cleanout manholes. An odor control system would be required by St. Cloud and likely dose into each of the new lift stations. A service connection fee and monthly usage fee would also be assessed to Foley by St. Cloud as part of the project. The City of Foley would be responsible for the operation and maintenance of the lift stations and forcemain.

Regionalization will result in decommissioning of Birch and Golf ponds. Decommissioning includes sludge removal, demolition of the pond structures, rehabilitation of the existing lift stations and pumps, and land acquisition for new infrastructure and lift station site. Regionalization would also better accommodate future regulations which may reduce effluent concentrations of existing parameters or introduce new parameter effluent limits.

Table 26 summarizes the preliminary engineer's opinion of probable costs for the regionalization alternative proposed for Foley. Both high- and low-strength wastewater scenarios are similar in cost due to the low additional flow corresponding to the additional high-strength wastewater. Regionalization will likely require a Class S operator license.

Table 26 – **Probable Cost for Regionalization**

Alternative	Preliminary Engineer's Opinion of Probable Cost		
	Capital Cost	Annual O&M Cost	20 Year Present Value [a]
Regionalization	$19,211,000	$448,500	$25,884,000
[a] 20 year period at 3.0% rate.			

6 Summary of Recommended Alternatives

Design alternatives are summarized in Table 27. For each alternative, the preliminary engineer's opinion of probable cost is presented for capital cost, yearly operation and maintenance cost, and 20 year present value. The 20 year present value assumes a 20 year service life for equipment at an annual 3.0% rate. Costs are also presented including accepting only PouchTec low-strength wastewater and high- and low-strength wastewater.

Although all reviewed treatment systems have the potential to meet the effluent concentrations required to meet the frozen mass limits for discharge, the stabilization pond system may struggle to consistently meet concentration limits. Variability in water temperature, climatic conditions, and operation will require additional operation attention and time to ensure optimal pond performance.

From Table 27 the lowest capital cost alternative for accepting only low-strength PouchTec wastewater evaluated was the aerated pond system, the lowest operation and maintenance alternative evaluated was the stabilization pond expansion, and the lowest 20 year present value alternative evaluated was the aerated pond system.

Table 28 provides a summary of anticipated operator hours and likely operator certification required by the MPCA for reporting associated with each alternative.

Based on the economical evaluation, the recommended alternative is the aerated pond system. The aerated pond system provides the most flexibility in expanding organic loading for future development at the lowest capital cost, and has the lowest anticipated increase in capital cost to accommodate high- and low-strength industrial waste from PouchTec. Additionally, it is anticipated to only require a Class C operator's license.

Table 27 – **Preliminary Engineer's Opinion of Probable Cost for Alternatives**

Alternative	Low-Strength Wastewater			High- and Low-Strength Wastewater		
	Capital Cost	Annual O&M Cost [a,c]	20 Year Present Value [b]	Capital Cost	Annual O&M Cost [a]	20 Year Present Value [b]
Stabilization Pond Expansion	$16,403,000	$100,700	$17,901,000	$27,982,000	$100,700	$29,480,000
Mechanical Package Plant	$11,088,000	$281,300	$15,273,000	$11,650,000	$313,600	$16,316,000
Aerated Pond System	$7,387,000	$214,000	$10,571,000	$7,584,000	$224,700	$10,927,000
Regionalization	$19,211,000	$448,500	$25,884,000	$19,211,000	$448,500	$25,884,000

[a] Assumes operator total compensation labor rate of $35.00 per hour.

[b] 20 year period at 3.0% rate.

[c] O&M costs include labor, chemicals, utilities, and maintenance/repairs and is used for comparison of the alternatives only.

Table 28 – **Preliminary Engineer's Opinion for Operation Requirements**

Alternative	Anticipated Annual Operator Labor Hours	Anticipated Operator Certification Class
Stabilization Pond Expansion	1,200	Class D
Mechanical Package Plant	3,550	Class A or B
Aerated Pond System	1,700	Class C
Regionalization	1,500	Class S

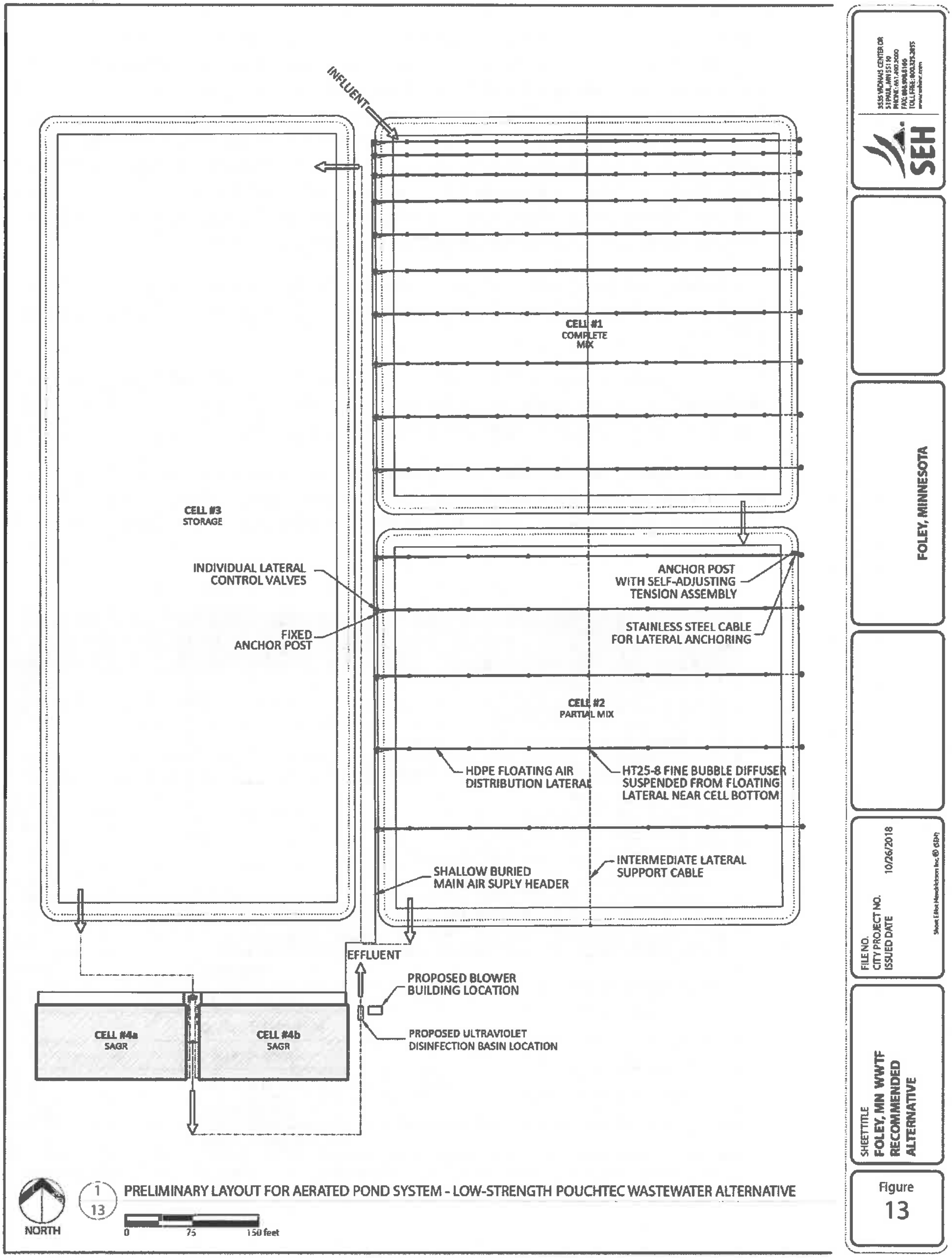
If high-and low-strength industrial wastewater is discharged by PouchTec, it is recommended that the City require the industrial user to implement best practices to minimize surge loading of the wastewater treatment system. It is recommended that PouchTec implement an equalization system to release high organic loads more evenly throughout the day. Regular sampling provides a transparent basis of billing for the industry and allows for better source control for wastewater treatment operations.

Summary of recommended improvements for the aerated pond system:

- Birch Lift Station
  - Rehabilitation of lift station structure and accessories
  - Replace wastewater pumps
- Broadway Lift Station
  - Rehabilitation of lift station structure and accessories
  - Replace wastewater pumps
- Birch Pond
  - Decommission pond
- Golf Pond
  - Convert primary cells to aerated pond
  - Two tertiary subsurface fixed film earthen polishing reactors
  - Effluent level control manholes for tertiary filters
  - Outdoor installation of in-channel ultraviolet disinfection
  - Blower, electrical, and chemical building with office and restroom
  - Process blowers
  - Chemical feed system
- Electrical, Instrumentation and Controls
  - Backup generator
  - Site utility service
  - SCADA system
- Miscellaneous
  - Water service to site
  - General site improvements for tertiary filter construction and access

Figure 13 illustrates a general layout of the aerated pond system proposed for Foley.

Figure 13 – **Preliminary Layout for Recommended Alternative**



7 Capital Costs

The previous sections referred to capital costs. Capital cost is the total costs to construct the upgrades to the wastewater facility exclusive of engineering or administrative costs. Assumptions about equipment and materials take-offs were done to prepare the construction cost estimates for facility planning purposes. Cost data from recent construction projects were utilized where appropriate. Other budgetary prices were obtained from equipment representatives or lump sums were used for piping, electrical, site work, contractor's overhead and profit, and bonds. The "Total Project Cost" in Table 29 includes capital costs, design engineering costs, and the engineering and City administration costs incurred during construction. Standard percentages for engineering and City administrative expenses related to the project was included.

The engineer's estimates of construction cost that follow are based on an October 2018 time frame. The Engineering News Record Construction Cost Index for this time period was 12,978.04.

The estimates do not account for inflation and the reader is cautioned to keep this in mind when reviewing the cost estimates. Since this report is a planning tool, these estimates, by their nature must be considered approximate and will need refinement as more detailed design develops.

The construction cost estimates include an allowance for contingencies. Contingency allowances are important in planning studies, when the focus is on developing conceptual solutions and the time and budget limitations require the details to be generalized. This report uses a 30-percent contingency.

Table 29 – **Summary of Recommended Alternatives**

Alternative		Preliminary Engineer Estimate of Capital Cost
1	Golf Pond Dredging	$237,600
2	Influent Control Structure	$69,000
3	Aerated Lagoon and Polishing Reactors	$2,377,500
4	Birch and Broadway Lift Station Improvements	$130,500
5	UV Disinfection	$125,500
6	Chemical Feed System	$29,300
7	Building to house UV, chemical feed, blowers	$284,200
8	Birch Pond Decommissioning	$379,800
9	Site work (grading, seeding, piping, water service, etc.)	$412,900
10	Electrical/Mechanical (power, SCADA, HVAC, generator, etc.)	$485,300
	Subtotal	**$4,531,600**
	Engineering [a]	$906,400
	Material Testing	$136,000
	Mobilization	$226,600
	Legal & Financial Administrative	$226,600
	Contingency	$1,359,500
	Total Capital Cost	$7,386,700

[a] Engineering fees include services for design, construction administration, full-time construction observation.

Operation and maintenance costs for the recommended improvements increased $90,000 per year for the low-strength wastewater and $101,000 for the high-and-low-strength wastewater with the recommended improvements. There is no projected increase in labor costs or staffing demand with the recommended improvements.

7.1 Financial Assistance

Until 1990, virtually every municipality constructing wastewater treatment facilities received funding through the Minnesota Pollution Control Agency and the U.S. Environmental Protection Agency construction grants program. When that program expired in 1990, cities pursued funding through other sources. These often have included the Public Facilities Authority (PFA), Farmers Home Administration (now referred to as USDA Rural Development [RUS/CF]), Department of Housing and Urban Development (HUD), and the Minnesota Department of Trade and Economic Development (DTED).

The most likely source of loan funds, based on availability, is from PFA. The PFA administers the Water Pollution Control Revolving Fund, which provides below market rate financing for upgrading and constructing wastewater treatment facilities. Interest rates are determined by a set formula based on demographic characteristics of the borrower and other established rules.

The PFA loan program was established to provide a permanent source of funding that could be used to finance municipal wastewater treatment projects in perpetuity. The program was created by the U.S. Congress in 1987, through amendments to the Clean Water Act, once it had decided to discontinue the construction grants program. Under this program, Congress mandated the Environmental Protection Agency (EPA) to establish and capitalize a Water Pollution Control Revolving Fund Program.

The capitalization grant received annually from EPA is used as a form of financial security for the sale of bonds by the Public Facilities Authority (PFA). Each year it is matched by State funds equal to 20 percent of the Federal grant. The money that PFA realizes through the sale of its bonds is used to award loans to municipalities for planning, design, and/or construction of wastewater treatment facilities. The PFA cannot sell an unlimited amount of bonds; a limit exists on PFA's bonding authority. In addition, the size of the capitalization grant, the financial capability of eligible cities, and the size of each community's project all affect the amount of bonds that PFA can sell.

Each year, the MPCA prepares an Intended Use Plan (IUP), which lists eligible cities that have requested loan assistance for that year. To be eligible for placement on the IUP, a community must have an approved facility plan and a community's name must first appear on the PPL list, which is a list of all communities needing new or upgraded wastewater treatment facilities. For placement on the PPL, interested cities must send a completed PPL application and Priority Point Ranking forms to the MPCA. To move to the IUP from the PPL, another short, written request is required.

Cities contemplating any type of wastewater treatment improvements should get their name on the PPL as early as possible in the planning process. A community's placement on the IUP does not guarantee it will receive a loan. The PFA is responsible for reviewing each city's financial capability and determining the amounts, terms, and conditions of the loans. Although a city may be placed on the IUP at any of several times during the year, it is advisable to request placement as early as possible to have the best chance of receiving a loan and having the fund available when needed. However, a city cannot be placed on the IUP for a construction loan until it has an approved Facilities Plan.

Before the PFA can award a loan, the MPCA must review and approve the city's loan application and then certify the project to the PFA. An application for a construction loan must include plans and specifications, and sewer use and rate documents. A construction project must also complete the environmental review process and have a National Pollutant Discharge Elimination System/State Disposal System (NPDES/SDS) permit before loan certification can be made. Nearly all costs associated with a wastewater treatment project are eligible, including costs incurred prior to loan award.

There are two categories of costs which are not eligible; these include:

- Storm Sewers; and
- Land that is not an integral part of the treatment process or that will not be used for the ultimate disposal of residues resulting from such treatment.

All other costs associated with facilities planning, preparation of contract documents including drawings and specifications, and construction are eligible. This includes legal, administrative, equipment, and any other costs related to the project.

Two key features of the PFA loan program are the requirements to:

- Pay Federal and State mandated wage rates during construction, and
- Use a qualified full-time inspector during major construction activity.

Other funding sources for wastewater treatment improvement projects such as this one are available. Loan funding is also available through Rural Development. These loans tend to have higher interest rates compared with PFA loans, but they can be paid back over longer periods, up to forty years, to keep the payments lower.

8 Recommendations / Implementation Schedule

A tentative schedule is proposed in Table 30. Tentative dates indicated are subject to change.

Table 30 – **Proposed Project Schedule**

Action	Tentative Date [a]
Submit Facility Plan	March 1, 2019
Request placement on IUP	June 1, 2019
Authorize preparation of design documents	September 1, 2019
Submit Plans and specifications to MPCA	March 15, 2020
Receive MPCA approval of plans and specifications	June 30, 2020
Begin construction	April 1, 2021
Improvements operational	November 1, 2021
Final Completion	June 30, 2022

[a] Tentative dates are subject to change

Wastewater must still be treated in accordance with the current NPDES permit during construction. In order to meet this requirement, the existing structures and facilities must remain in operation during the construction of the new facilities and temporary shutdowns during periods of low flows may be required for connection of the new facilities with the existing facilities.

8.1 Estimated Sewer Service Charge

Understanding the impact the new capital projects will have on the existing rates requires knowledge of the existing annual operations and maintenance costs and an understanding of how those annual costs will change with the capital projects in place. This evaluation provided an estimated impact to future wastewater user rates based on existing costs and projected future costs.

It is estimated that at design conditions the facility will cost approximately $ 89,000 more per year to operate and maintain than was budgeted in 2018 for the low-strength wastewater and $101,000 more per year for the high-and-low-strength wastewater. Recognizing that at design conditions there is more flow and load than the facility sees today and in the future the cost would be spread among more users, for the basis of estimating the impacts to the current user rates, the projected O&M costs were estimated to be 85% of the O&M costs at design conditions..

Based on assumptions that the City would be eligible for $0 (Wastewater Infrastructure Fund) WIF grant and $0 Point Source Implementation Grant (PSIG), the City would need to finance $7,386,700 million (assuming there are no City wastewater funds available). Table 30 summarizes the annual loan payment for the different loan terms based on the amount needed to finance for the low-strength wastewater recommended alternative.

Table 31 – **Loan Payment for Low-Strength Wastewater**

Parameter	Scenario 1	Scenario 2
Amount to Finance	$7,386,700	$7,386,700
Loan Term	20 years	30 years
Interest Rate	1.5%	1.5%
Loan Payments, Semi Annual	40	60
Semi Annual Payment	$214,437	$153,336
Annual Payment	$428,874	$306,671

[a] Assumes a total project cost of $ less $0 in WIF grant and less $0 in PSI grant.
[b] At a 2.0% interest rate the annual payment for scenario 1 (20 year loan term) increases by $21,059 and scenario 2 (30 year loan term) by $21,955.

Table 32 summarizes the annual loan payment for the different loan terms based on the amount needed to finance for the high-and-low-strength wastewater recommended alternative.

Table 32 – **Loan Payment for High-and-Low-Strength Wastewater**

Parameter	Scenario 1	Scenario 2
Amount to Finance	$7,584,000	$7,584,000
Loan Term	20 years	30 years
Interest Rate	1.5%	1.5%
Loan Payments, Semi Annual	40	60
Semi Annual Payment	$220,165	$157,431
Annual Payment	$440,329	$314,863

[a] Assumes a total project cost of $7,584,000 less $0 in WIF grant and less $0 in PSI grant.
[b] At a 2% interest rate the annual payment for scenario 1 (20 year loan term) increases by $21,622 and scenario 2 (30 year loan term) by $22,541.

The City's user rates should be set at a level to cover the annual payments for the financing as well as the annual O&M costs. The resulting annual payments are identified in Table 33.

Table 33 – **Annual Payments**

Parameter	Scenario 1	Scenario 2
Existing O&M	$422,564	$422,564
Additional O&M	$89,347	$89,347
Annual Financing Payment [a]	$428,874	$306,671
Total Annual Cost	$927,383	$805,180
Current Annual Revenue	$422,564	$422,564
Net Increase Cost	$504,819	$382,616
% Increase	119%	91%

[a] Assumes loan terms as identified in Table 29.

Based on the existing wastewater user rate structure a typical residential family using 4,000 gallons of water per month pays approximately $26.40 per month. Assuming the same typical residential user, a 20-year loan term (Scenario 1) would result in the user paying approximately $57.94 per month. With a 30-year loan (Scenario 2), the user amount is $50.30 per month. For the high-and-low-strength wastewater alternative, the additional capital and O&M costs would be distributed to the high-strength contributor(s) and the impact to individual residents would remain the same as the low-strength wastewater alternative.

8.2 Rate Analysis

The estimated rate impact in section 8.1 is an estimate based on the City's past expenditures and revenues for the wastewater collection and sewer fund, as well as current rates and estimated capital costs. It is also based on assumptions for the type of funding programs used and the amount of grant the City would be eligible for. It is recommended the City evaluate further the specific change in rates with a detailed rate analysis. This analysis should be performed following more detailed cost estimates during the design process and when the type of funding and potential grant dollars is better known. A detailed rate analysis will include expenditures, existing debt, capital cost, O&M and replacement costs, depreciation of structures and equipment, and other costs associated with the project. The analysis may include rates for residential, commercial, and industrial depending on the needs of the City.

8.3 Public Hearing

A public hearing to present the contents of this report is scheduled for 2019. The public hearing documents will be included in Appendix H.